

## Durham Swimming Pool Assessment Study





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In the Spring of 2014, Szostak Design was commissioned by the City of Durham General Services Department to prepare a comprehensive assessment of the city's five aquatic facilities and four spraygrounds. The study was to identify and prioritize aquatic, mechanical, electrical, plumbing, structural, accessibility and energy efficiency deficiencies at each facility and include an analysis of current conditions and recommendations for improvement<sup>1</sup>. A cost model of recommended repairs and improvements was to be included in the study, as well as a projection of annual maintenance costs anticipated for each facility.

### 1.1 Facilities Included In The Study

1. Forest Hills Pool and Sprayground, 1639 University Avenue
2. Long Meadow Pool, 917 Liberty Street
3. Hillside Pool and Sprayground, 1221 Sawyer Street
4. Edison Johnson Aquatic Center and Sprayground, 500 West Murray Avenue
5. Campus Hills Aquatic Center, 2000 South Alston Avenue
6. East End Park Sprayground, 1200 North Alston Avenue

### 1.2 Study Design Team Members

Architectural  
Szostak Design  
Chapel Hill, North Carolina

Aquatic Consultant  
Counsilman-Hunsaker  
St. Louis, Missouri

MEP Engineering  
Sigma Engineered Solutions  
Morrisville, North Carolina

Structural Engineering  
Mulkey Engineers and Consultants  
Cary, North Carolina

### 1.3 City of Durham Study Team Members

#### Durham General Services

Marilee Martin, RLA  
Senior Construction Project Manager

Beth Timson  
Assistant Director

DPR and Aquatics Staff and General Services and Facilities  
Operations Staff

### 1.4 Methodology

Beginning in March 2014, the Design Team collected existing documentation, performed detailed site surveys of each facility and interviewed numerous Aquatics Department staff members. During this initial phase of the investigation, the team identified a serious electrical hazard at Long Meadow Pool and recommended closure of the facility until repairs could be initiated. The team assisted in the development of a series of emergency repairs intended to permit the pool to reopen for the 2015 summer swimming season. This work was initiated and is nearing completion.

Concurrent with the work at Long Meadow, the team finalized a list of code violations and deficiencies for each of the other aquatic facilities and prepared an estimate of probable cost for the necessary repairs and renovations. The team made two presentations of its findings to the Durham City Council, one in October 2014 focused on Long Meadow Pool followed a full aquatics system overview in January 2015.

The report that follows is organized by facility. Each section begins with two synopsis pages, the first summarizing key statistics for each pool and the second detailing a prioritized ranking of deficiencies to be addressed, including line item cost estimates. Deficiencies are ranked accordance with the following priority matrix established by General Services.

### 1.5 Priorities

Priority 1 – Public Safety/Code Compliance/ADA Compliance

Priority 2 – Deferred Maintenance/Aging Systems

Priority 3 – Building System Upgrades to Improve Operations

Priority 4 – Exterior and Interior Refurbishment

Priority 5 – Functional Changes<sup>2</sup>

The introductory pages are followed by more detailed descriptions of the facility and a series of notes that further articulate each identified deficiency and its proposed repair, remediation or renovation.

The study concludes with a summary overview of the City of Durham Aquatics system and general recommendations for its improvement in the coming years.

#### Notes

1. Due to recent ADA upgrades at several of the facilities' bathhouses, a full assessment of bathhouses was excluded from the scope of this study

2. No changes in use in use are anticipated by this study, therefore this ranking is not used.



### 2.1 Forest Hills Pool

#### Key Issues

90 year-old facility built in approximately 1926  
Location of support structures in flood plain limits repair expenditures  
Exterior ramp non-ADA compliant and failing structurally  
Vinyl shell liner requires replacement  
Pool inaccessible to patrons with physical disabilities  
Miscellaneous additional code violations  
Miscellaneous deferred maintenance issues

**Opinion of Probable Cost for Repairs and Renovations**  
\$210,456

**Recommended Annual Maintenance Allowance**  
\$10,000<sup>1</sup>

**Estimated Service Life after Repairs and Renovations**  
5-7 Years



### 2.2 Long Meadow Pool

#### Key Issues

Electrical hazard due to water infiltration in Pump Room  
Pool shell leakage  
Location in floodplain limits repair expenditures  
Pool inaccessible to patrons with physical disabilities  
Miscellaneous additional code violations  
Miscellaneous deferred maintenance issues

**Opinion of Probable Cost for Repairs and Renovations**  
Minimum - \$165,987. Maximum - \$330,987

**Recommended Annual Maintenance Allowance**  
\$15,000<sup>1</sup>

**Estimated Service Life after Repairs and Renovations**  
3-5 Years

### 2.3 Hillside Pool

#### Key Issues

Pool shell leakage  
Pool inaccessible to patrons with physical disabilities  
Miscellaneous additional code violations  
Miscellaneous deferred maintenance issues  
Inadequate visibility and security

**Opinion of Probable Cost for Repairs and Renovations**  
\$139,548

**Recommended Annual Maintenance Allowance**  
\$10,000<sup>1</sup>

**Estimated Service Life after Repairs and Renovations**  
20-25 years



### 2.4 Edison Johnson Aquatics Center

#### Key Issues

Failing dehumidification unit  
Inaccessible light fixtures  
Miscellaneous code violations  
Miscellaneous deferred maintenance issues

**Opinion of Probable Cost for Repairs and Renovations**  
\$887,992

**Recommended Annual Maintenance Allowance**  
\$25,000<sup>1</sup>

**Estimated Service Life after Repairs and Renovations**  
20-25 years





## 2.5 Campus Hills Aquatic Center

### Key Issues

Failing dehumidification unit  
Hazardous light fixtures  
Deteriorating deck finish  
Miscellaneous code violations  
Miscellaneous deferred maintenance issues

**Opinion of Probable Cost for Repairs and Renovations**  
\$934,362

**Recommended Annual Maintenance Allowance**  
\$25,000<sup>1</sup>

**Estimated Service Life after Repairs and Renovations**  
25-30 years



## 2.6 East End Park Sprayground

### Key Issues

Water ponding on adjoining sidewalk  
Shared water service with adjacent rest rooms limits pressure for the sprayground

**Opinion of Probable Cost for Repairs and Renovations**  
\$35,880

**Recommended Annual Maintenance Allowance**  
\$500<sup>1</sup>

**Estimated Service Life after Repairs and Renovations**  
15 years

## 2.7 Opinion of Total Probable Cost – Aquatics System Repairs and Renovations

\$2,374,225

## 2.8 Total Recommended Annual Maintenance Allowance

\$85,500

## 2.9 Further Recommendations

1. Prepare and implement a comprehensive proposal for security at all facilities.
2. Commission a comprehensive master plan study of the needs for aquatics facilities in the Durham parks system to direct the upgrade of existing facilities and recommend the scale, capabilities and locations for new facilities over the course of the next 30 years.

1. A description of the determination and application of this allowance is included with individual pool assessment, contained within the body of this report.

<h1>Forest Hills Pool</h1>	 
<p>Address 1639 University Drive Durham, North Carolina 27707</p>	
<p>Summary Description Outdoor seasonal rectangular swimming pool with remote sprayground</p>	
<p>Metrics</p> <p>Dimensions: 32' x 70'</p> <p>Perimeter: 204'</p> <p>Surface Area: 2,240 Square Feet</p> <p>Depth Range: 3' - 0" to 5' - 0"</p> <p>Estimated Volume: 67,025 Gallons</p> <p>Code Required Flow Rate: 186 GPM</p> <p>Estimated Flow Rate: 315 GPM (based on filter capacity)</p> <p>Code Required Turnover Rate: 6 Hours</p> <p>Estimated Turnover Rate: 3.5 Hours</p> <p>Pool Season: 9 1/2 Weeks, June-August</p> <p>Sprayground: 19 Weeks, May - September</p>	  
<p>Year of Construction 1920s</p> <p>Major Renovation(s) 2001 - Vinyl shell liner installed</p>	<p>Notes</p> <p>Shell: Concrete pool shell with vinyl liner</p> <p>Gutter: Continuous rollout gutter perimeter overflow system with PVC grating</p> <p>Sprayground: Potable water flow discharging into sanitary sewer.</p> <p>Water is not recirculated.</p>

Facility: Forest Hills Pool									
Priority	Ref.	Issue	Category	Recommendation	Net Cost	Total Cost	Permit Req'd	A&E Design Req'd	Notes
1 Public Safety Code Compliance	1A.	Non-Compliant ADA Ramp Failing Retaining Wall	Code Age	Replace ADA Ramp	\$ 70,000	\$106,260 (3)	Yes	Yes	FH.1
	1B.	Non-Compliant Dry Ramp Pool ADA Access	Code	Install ADA-Compliant Lift	NA	\$ 6,500	No	No	FH.2
	1C.	VGB Drain Covers	Code	Replace	\$ 2,500	\$ 3,000 (1)	No	No	FH.3
	1D.	Inaccurate, Depth Markers	Code	Inventory and Replace Inaccurate, Inconsistent Markers	\$ 2,500	\$ 3,450 (2)	No	No	FH.4
	1E.	Chemical Storage Below Flood Plain	Code	Elevate Storage 2' Above Flood Plain	\$ 2,000	\$ 3,450 (2)	No	No	FH.5
	1F.	Rest Room Handrails	Code	Provide 2 Vertical Grabbars	\$ 900	\$ 1,242 (2)	No	No	Fh.6
	1G.	Deck Width < 8'	Code	Grandfathered - No Action					FH.7
2 Deferred Maintenance Aging Systems	2A.	Vinyl Pool Liner Deterioration	Age	Replace Vinyl Pool Liner	\$ 36,000	\$ 49,680 (2)	No	No	FH.8
	2B.	Stantrol Chemical Controller	Age	Replace	\$ 6,000	\$ 8,280 (2)	No	No	FH.9
	2C.	Pool Deck Cracks	Age	Repair and Seal	\$ 3,000	\$ 4,410 (2)	No	No	FH.10
	2D.	Sheetrock Damage	Age	Repair Sheetrock	\$ 1,200	\$ 2,760 (2)	No	No	FH.11
	2E.	Damaged Louver Chemical Storage	Age	Replace Louver	\$ 1,000	\$ 1,380 (2)	No	No	FH.12
	2F.	Slow Running Gutter Drain Line	Maintenance	Inspect and Clean as Necessary	NA	NA			FH.13
3 Building and System Upgrades	3A.	Baskwash Pit Undersized	Upgrade	Reconstruct	\$ 2,000	\$ 3,036 (3)	Yes	No	FH.14
	3B.	Wayfinding	Upgrade	Design Wayfinding Strategy Install Signage	\$ 6,000	\$ 9,108 (3)	No	Yes	FH.15
	3C.	Dry Ramp	Upgrade	Infill Dry Ramp. Remove Rail	NA	\$ 7,900	No	No	FH.16
	3D.	Shared Water Service	Upgrade	Separate Water Service for Spray Ground. No Action	NA	NA			FH.17
TOTAL ESTIMATE OF PROBABLE COST						\$210,456			
<div>Keyed Notes</div> <div>(1). 20% Contingency</div> <div>(2). 20% Contingency + 15% P and O</div> <div>(3). 20% Contingency + 15% P and O +10% A and E Fee</div> <div>(4). 20% Contingency + 15% P and O + 40% A and E Fee</div> <div><div></div> Denotes Completed Work</div>									

### 3.1 Forest Hills Pool

#### 3.11 Overview

Forest Hills Pool is a small, rectangular pool built in the early 20th century. It has limited deck space and no specialized aquatic amenities. It is typically operated for 9 1/2 weeks during the summer months. The facility also features a small sprayground area southeast of the pool. The sprayground is typically operational for 19 weeks, from early May through late September.

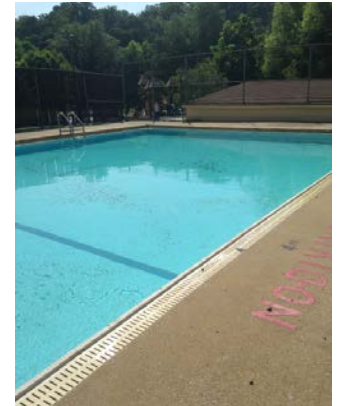
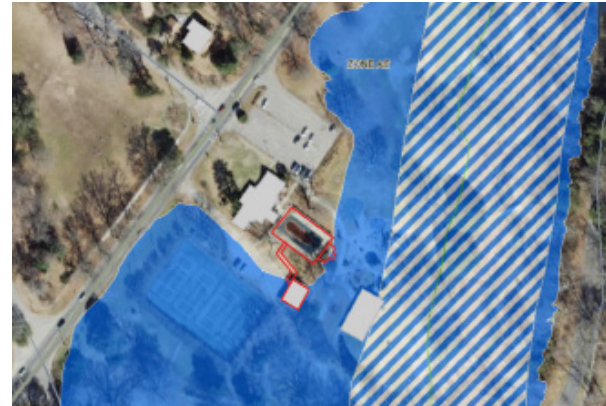
Forest Hills Pool is subject to periodic flooding and any new facility Improvements will be at the same risk. Some types of repairs may require that the structures be brought into full compliance with City and FEMA floodplain requirements. Full compliance means either floodproofing the structures or raising them two feet above the floodplain elevation of 302.4 feet. Although the pool itself is above the floodplain elevation, the pool's Pump Room, Chemical Storage Room and Bathhouse and Admissions area are all below this minimum elevation.

#### 3.12 Summary of Aquatic Features

The pool shell is concrete construction and currently has a vinyl liner. Depth markings are placed at the points of maximum and minimum depths and spaced within the maximum distance of 25 feet apart as required by the code. Several of the depth markings are inaccurate. "No Diving" markers are located around the entire pool deck and meet code requirements.

Main drains are located at the deepest section of the pool as required by code and are VGB-compliant. Two additional 9" round drains are located in the deep end of the pool. The gutter overflow system is in good condition and measures approximately 9.5" wide by 14.5" deep. The gutter is covered with PVC grating that is continuous around the pool's perimeter.

The pool's deck space is limited by a perimeter chain linked fence. The tightest area of the deck is the distance from the pool's shallow end to the fence, which measures between 6'-4"



Clockwise from Top Left:  
Forest Hills Pool aerial  
photograph showing extent  
of flood plain (blue). The  
pool shell as seen from the  
northwest. An aerial view of  
the facility.

and 7'-4". The deck pavement is uneven and has been patched in several places. There is a dry ramp located along the shallow end of the pool that does not satisfy the ADA requirements for access, takes up deck space and is an obstruction to deck use. The sprayground has two above-grade features and multiple ground features, all in reasonably good condition. The sprayground operates as a flow-through system. Potable water used for the aquatic features flows directly to waste without being re-circulated.

The Pump Room for Forest Hills is located partially below grade, south of the deep end of the pool. The site slopes to the south allowing for an at-grade entry to the room. The pool recirculation pump is a Pentair EQ series pump with integral strainer that was fairly recently installed. The pump is in good condition.

The pool piping systems are primarily schedule 40 PVC. The pool filtration system is comprised of three Pentair TR-100 fiberglass filters. The filters are in good condition. The filter backwash is routed out of the Pump Room to the sanitary sewer system. The maximum filtration rate per TR-100 filter is 106 gpm, well within the code requirement of a rate not to exceed 15 gpm/sq. ft. of filter. Therefore the maximum recirculation rate for the pool system based, upon the size limitations of the filtration system is 318 gpm.

The pool water fill system is a manual system with the control valve located in the Pump Room. There is an over-the-rim fill at the pool deck. The pool chemicals utilized for sanitation and pH balance of the pool are sodium hypochlorite and carbon dioxide. The pool chemicals and chemical feed systems are located in a dedicated pool Chemical Storage Room with an emergency eyewash/shower station. The chemical feed systems appear to be in good condition and the room has mechanical ventilation. The water chemistry controller is a Strantrol System 4, located in the Pump Room. The electrical service to the Pump Room has been updated and is in excellent condition. The potable waterline size and pressure on site is such that if the pool fill is operating there is insufficient water pressure to operate the sprayground simultaneously.

3.13 Operating Costs

Recent, annual operating and maintenance costs at Forest Hills Pool for the 2014 season are as follows:

Personnel (FY 2014)	\$15,708
Operating* (FY 2014)	\$10,550
Maintenance Costs (Calendar Year 2013)	\$ 4,210
<hr/>	
Total	\$30,468

\*Operating costs include utilities, equipment and expendable supplies.

3.14 Annual Maintenance Allowance Recommendation

Based on the advanced age and floodplain location of Forest Hills and assuming each of the repair and renovation recommendations included in this report is addressed, the Design Team recommends that thereafter an annual maintenance allowance of \$10,000 be allocated.

3.15 General Assessment

The Forest Hills Pool is approaching a century of service and has significant challenges. If it is to remain in operation, many of the code violations and deficiencies identified in this report will need to be addressed. Other needed improvements, including elevating pump room equipment and chemical storage above the floodplain, will exceed FEMA and UDO restrictions on expenditures for floodplain repairs.

Even with the implementation of the majority of the recommended improvements, Forest Hills will certainly exceed its effective service life within the next five to seven years. And while the pool can continue to serve as a very limited-use neighborhood facility during this period, it should be considered for replacement. Functionally, the pool offers only open water with none of the additional recreational features valued by patrons, including play features and areas for lap swimming.

### 3.16 Keyed Renovation and Repair Notes

#### FH.1/Code Violation - Existing Ramp Access to Pool Enclosure

The ramped sidewalk leading from the facility's Cashier Station/Bathhouse to the pool enclosure exceeds ADA requirements for maximum slope and has a handrail on only one side. The landing at the ramp's entry point frequently floods and retains ponded water. The existing retaining wall to the east of the ramp shows evidence of significant movement, likely caused by pressure exerted on the back of the wall by the soil. This wall most likely does not have an adequate footing to resist the soil's surcharge. The movement has caused the wall to crack and separate at the corners. If left unrepaired, this wall will further deteriorate to the point of collapse in the coming years.

In addition, the rail enclosing the ramp does not extend continuously from the cashier station to the pool enclosure entrance, permitting unauthorized access into the pool area.

Recommendation: The sidewalk, ramp and retaining wall should be replaced immediately with a fully code-compliant ramp that does not collect water. The conceptual design for this ramp replacement should preclude unauthorized access into the pool enclosure area, but should also afford easy access for maintenance personnel and equipment, likely with the introduction of a lockable gate.

#### FH.2/Code Violation - Non-ADA-Compliant Dry Ramp

The facility's dry ramp is no longer permissible as an ADA-compliant means of accessing the swimming pool.

Recommendation: Install an ADA-compliant lift on the deck near the shallow end of the pool. The installed position of the lift must not constrict the minimum deck width of eight feet. Accordingly, a location in the northeast corner of the deck is recommended. However, this location may create a conflict with an existing pool access ladder. If the existing dry ramp is infilled (see FH.14) to



Top:  
Non-code compliant ramp,  
deteriorating retaining wall to  
right of photo.

Middle Left:  
Dry ramp west of the pool  
shell.

Middle Right:  
Inaccurate depth marker.

Bottom:  
Chemical storage containers  
below flood plain elevation.

provide a clear deck width of 13 feet, a location at the northwest corner of the deck would also be suitable. A battery-operated lift is recommended.

#### **FH.3/Code Violation – VGB Drain Covers**

The present VGB drain covers are nearing the end of their warranted life.

Recommendation: Replace two VGB drain covers.

#### **FH.4/Code Violation – Inaccurate and Inconsistent Depth Markers**

Several of the pool's depth markings are inaccurate with a depth marking 3'-0" feet in a location where the water depth actually measures 2'-6." T "No Diving" markers are located around the entire pool deck and are positioned compliant with the code.

Recommendation: Contract with a swimming pool technician to perform a detailed assessment of the accuracy and code-compliance of all existing depth and "No Diving" markers. The technician should prepare a cost estimate for satisfying the code's requirements and perform replacement work as necessary. The use of inlaid ceramic tile markers is recommended.

#### **FH.5/Code Violation – Chemical Storage.**

Pool chemicals are presently stored either in bulk or in containers on shelves raised approximately 12" to 14" above the concrete floor of the Chemical Storage Room. The grade elevation of this room is approximately 298.5.' The flood plain at this location is 302.4.' City of Durham UDO regulations require all stored chemicals to be placed two feet above the flood plain, an elevation of 304.4.'

Recommendation: Shelving for the pool chemical storage must be raised to a minimum height of 5.9 feet above the floor. Vessels containing pool chemicals must either be raised to a similar height, or if placed at a lower height, all openings into the

vessels must be at a minimum height of 5.9 feet above the floor and the vessels must be securely anchored to prevent dislodging during a flood event. Provisions to permit staff access to the elevated shelving will be required but may not be operationally practical.

***The existing height of the ceiling in this room is approximately seven feet. Elevating shelving and chemical vessels above the required 5.9 foot minimum above-floor height may require significant ceiling and roof truss modifications, the cost of which will likely exceed UDO and FEMA restrictions on the value of repairs in the floodplain.***

Note: The UDO requires that all electrical equipment also be elevated to a height two feet above the flood plain. At present, the majority of equipment in the facility's pump room is located below this elevation including pumps (300.5') and electrical panels (302.5'). ***It is not economically feasible to elevate this equipment and would exceed UDO and FEMA restrictions on the value of repairs in the floodplain. Accordingly, this repair is not recommended.***

#### **FH.6/Code Violation – Rest Room Handrails**

Vertical grab bars in accessible toilet stalls are required.

Recommendation: Provide one vertical handrail in both designated accessible toilet stalls.

#### **FH.7/Code Violation – Deck Width**

The code requires a minimum deck width of 8'-0" for all outdoor pools. Forest Hill's deck is between six and seven feet on the north and seven feet the west where the deck is interrupted by the existing dry ramp.

Recommendation: The facility's deck width has previously been accepted by health department inspectors as a grandfathered condition and need not be amended at this time. There is no effective remedy to increase the deck width on the north

however, if the dry ramp on the west is infilled (See FH.16), this area of the deck would be in compliance.

#### **FH.8/Age – Vinyl Pool Shell Liner**

The present vinyl pool shell liner was installed in 2000. It is no longer adhered to the surface of the original concrete shell, sags along the interior corners of the pool and is noticeably “spongy” underfoot. Staff reports that there was water loss prior to the installation of the pool liner. At present the pool retains water during the off-season, suggesting that whatever leakage persists is minimal, likely due to evaporation and oversplash.

Recommendation: The typical expected lifespan of a vinyl pool shell liner under normal use is ten years. This liner is over 14 years old and should be replaced.

Concurrent with the liner replacement, the underlying pool shell, main drains and associated piping should be accessed to determine the source of any water loss. Engage a testing service to determine source of leaks, estimate costs and repair as necessary.

#### **FH.9/Age – Stantrol System 4 Chemical Controller**

The Stantrol chemical controller is 20 years old and approaching the end of its effective service life. In addition, the Stantrol brand is no longer supported by its parent company, BECS. Repairs to this unit and replacement parts will become increasingly difficult to acquire.

Recommendation: The chemical controller should be replaced. Because chemical controller replacement is an issue that affects several other of the department’s pools, staff should evaluate and then recommend a preferred manufacturer for all controller replacements, based on their assessment of performance, cost, reliability and available technical support.

#### **FH.10/Age – Pool Deck**

There are a number of cracks in the surface of the pool deck, some of which represent tripping and/or abrasion hazards. In addition, a previous repair to the deck joint at the pool enclosure entrance gate is excessively high and inhibits the passage of rolling equipment.



Top:  
Stanrol Chemical Controller.

Bottom:  
Forest Hills Sprayground.

Recommendation: Cracks in excess of 1/4" vertical or horizontal displacement should be ground smooth and filled with sealant. The raised joint at the pool enclosure entrance gate should be repaired in conjunction with the construction of the replacement entrance ramp (See FH.1).

#### **FH.11/Age – Sheetrock Damage**

The sheetrock ceiling in the Chemical Storage/Pump Room is deteriorating and requires replacement.

Recommendation: Replace the sheet rock ceiling with a cement fiber board ceiling.

#### **FH.12/Age – Chemical Storage Room Louver**

The fresh air louver is not watertight.

Recommendation: Replace the louver with a comparable air flow capacity that includes protection from water infiltration.

#### **FH. 13/Maintenance - Pool Gutter Drain Line**

The drainage line serving the pool's guttering system has been observed to run slowly.

Recommendation: The drain line should first be inspected and cleared as a part of regular annual maintenance tasks. If the gutter circulation does not improve, further investigation of the system flow rates will be required.

#### **FH.14/Upgrade – Backwash Pit**

The backwash pit is inadequately sized for the discharge flow rate of the pool's backwash cycle, leading to flooding in the pump room that risks accidental electrical discharge, which compromises staff safety.

Recommendation: Reconstruct the backwash pit as necessary to provide adequate capacity for the desired rate of discharge.

#### **FH.15/Upgrade – Wayfinding**

Patron access to the pool's point of admission from the parking area is indirect and counterintuitive. There are three separate parking areas available for patron use, including one added for ADA-complaint parking however it is not readily evident to arriving patrons that all parking lots are available for use. As a consequence, the main parking area is frequently filled despite the availability of parking spaces in the remaining parking areas.

Recommendation: Provide better directional signage clearly calling out the path from the parking area to the point of admission. Signage upgrades should also better define the location of, and vehicular access to alternative parking areas, including that designated for ADA-complaint spaces.

#### **FH.16/Upgrade – Dry Ramp**

The existing dry ramp is no longer ADA-compliant. Its position restricts the width of the deck below the code minimum of eight feet and impedes patron access to the deck from the pool.

Recommendation: Infill the dry ramp with concrete and remove its handrail. (This work is scheduled for May 2015)

#### **FH.17/Upgrade – Sprayground Water Supply**

The water supply for the sprayground is tied to the pool's primary water service. As a consequence, the sprayground cannot be operated whenever the pool is being refilled. Given the daily loss of pool water due to leakage and evaporation during a typical 9 1/2 summer week season, the pool is refilled each day for a period of up to thirty minutes. During this time, the sprayground is not operational. The staff considers this a considerable inconvenience for sprayground patrons.

Recommendation: A separate water service could be provided for the sprayground, however this may not be a priority at this time and a cost estimate for the work is not included in the overall budget. An order of magnitude cost for this work, should it be undertaken, is approximately \$16,000.

# Long Meadow Pool

## Address

917 Liberty Street  
Durham, North Carolina 27701

## Summary Description

Outdoor seasonal rectangular swimming pool

## Metrics

Dimensions: 99' x 49'  
Perimeter: 295'  
Surface Area: 4,818 Square Feet  
Depth Range: 2' - 6" to 9' - 6"  
Estimated Volume: 173,950 Gallons

Code Required Flow Rate: 484 GPM  
Estimated Flow Rate: 424 GPM (based on filter capacity)  
Code Required Turnover Rate: 6\* Hours  
Estimated Turnover Rate: 6.8 Hours

Pool Season: 9 1/2 Weeks - June - August

\* Current turnover rate grandfathered for pools constructed prior to May 1, 1993 - 15A NCAC 18A .2510

## Year of Construction

1963

## Major Renovation(s)

1980 - Construction of inner pool shell over original shell and installation of pool bottom inlet system  
2014 to Present: Leak assessment, leak repairs, stormwater line replacement and new pool water supply piping



## Notes:

Shell: Original shell, concrete. Shell Insert - Concrete with plaster finish  
Gutter: Continuous rollout gutter perimeter overflow system, PVC grating  
Circulation System (2014): Adjustable return inlets at pool shell floor (90)  
Circulation System (2015): 30 sidewall inlets

Facility: Long Meadow Pool									
Priority	Ref.	Issue	Category	Recommendation	Net Cost	Total Cost	Permit Req'd	A&E Design Req'd	Notes
1 Public Safety Code Compliance	1A.	Pool Shell Leakage Initial Leak Repair	Code	Identify and Repair Six Pool Shell Leaks	NA	\$ 7,966.46	No	Yes	LM.1
	1B.	Pool Shell Leakage/Gutter	Code	Remove Gutter Tile and Piping Replaster. New Inlet Piping	NA	\$27,989.74	No	Yes	LM.2
	1C.	Pump Room Infiltration Deck Crack	Code	Seal Deck Cracks	NA	\$ 6,873.73	No	Yes	LM.3
	1D.	Pump Room Infiltration Open Stair Well	Code	Provide Rain Shelter to Pump Room Stair Well	NA	\$ 2,300	No	No	LM.4
	1E.	Pump Room Infiltration Clogged Storm Drains	Code	Replace Inoperable Stormdrain Line	NA	\$ 56,060	Yes	No	If completed measures fail, further measures will add \$165,000. LM.5
	1F.	Non-Compliant Dry Ramp	Code	Install ADA-Compliant Lift	\$ 8,000	\$ 9,600 (1)	No	No	LM.6
	1G.	Broken VGB Drain Cover	Code	Repair		NA	No	No	LM.7
	1H.	Inaccurate Depth Markers	Code	Inventory and Replace Inaccurate, Inconsistent Markers	\$ 2,000	\$ 2,760 (2)	No	No	LM.8
	1J.	Pump Room Stair - Tread Deterioration. No Handrails	Code	Repair Stair Treads. Provide Two Code-Compliant Handrail	\$ 6,000	\$ 8,280 (2)	No	No	LM.9
	1K.	Perimeter Access Gate Non-Self Closing/Locking	Code	Provide Gate Locks and Closers	\$ 750	\$ 1,035 (2)	No	No	LM.10
	1L.	Chemical Storage Below Flood Plain	Code	Elevate Chemical Storage Vessels 2' Above Flood Plain	\$ 2,000	\$ 2,760 (2)	No	No	LM.11
	1M.	Pool Water Tunover Rate	Code	6.8 Hour Grandfathered - No Action	NA	NA			LM.12
2 Deferred Maintenance Aging Systems	2A.	Leaking Supply Valve	Age	Repair Supply Valve	\$ 1,000	\$ 1,380 (2)	No	No	LM.13
	2B.	Misplaced Sight Port	Maintenance	Provide New Sight Port	\$ 900	\$ 1,242 (2)	No	No	LM.14
	2C.	Missing Manifold	Maintenance	Install Replacement Manifold	\$ 1,000	\$ 1,380 (2)	No	No	LM.15
	2D.	Spawed Concrete Structure	Maintenance	Patch Concrete Beams	\$ 6,000	\$ 8,280 (2)	No	No	LM.16
	2E.	Water Slide Finish	Age	Paint Structure, Repair Flume	\$ 8,000	\$ 11,040 (2)	No	No	LM.17
	2F.	Filter Sand	Age	Replace Filter Sand	\$ 5,000	\$ 6,000 (1)	No	No	LM.18
3 Building and System Upgrades	3A.	Infil Dry Ramp	Upgrade	Infil Dry Ramp. Remove Rail	\$ 8,000	\$ 11,040 (2)	No	No	LM.19
	3B.	Access to Pump Room Stair Outside Perimeter	Upgrade	Fabricate New Gate and Install Inside Perimeter Fence	NA	NA			Repair by Facilities Operations. LM.20
TOTAL ESTIMATE OF PROBABLE COST						\$165,987			
Keyed Notes (1) 20% Contingency (2) 20% Contingency + 15% P and O (3) 20% Contingency + 15% P and O +10% A and E Fee (4) 20% Contingency + 15% P and O + 40% A and E Fee									
<div><div></div> Denotes Completed Work</div>									

## 3.2 Long Meadow Pool

### 3.21 Overview

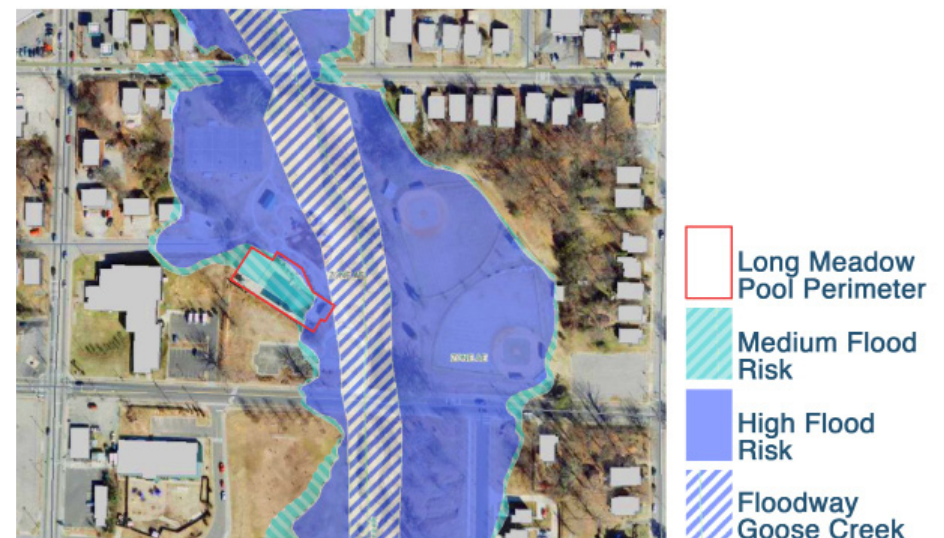
Long Meadow Pool is an outdoor seasonal pool originally constructed in 1963. A second concrete pool shell was constructed in 1980 within the volume of the original rectangular pool shell in, which remained in place. At that time a new, underfloor water supply system was also installed. A recreational waterslide was added to the facility in 1999. There is a Bathhouse and Admissions area northwest of the pool and a Chemical Storage Building on the southeast. The facility's Pump Room is located approximately ten feet beneath the pool deck, adjacent to the deep end of the pool.

Because of its location within the floodplain, Long Meadow Pool is subject to flooding. Virtually the entire facility is located below the floodplain elevation of 337.8' and is at considerable risk for flooding - particularly its subgrade Pump Room, which has a floor elevation of approximately 328.0.' Any new facility improvements will to be at risk for recurring inundation.

Some types of repairs may require that the structures be brought into full compliance with FEMA and UDO floodplain requirements. Full compliance means either floodproofing the structures or raising them two feet above the floodplain elevation of 337.8.' Both options are considered to be prohibitively expensive for a facility of this age.

The pool's Pump Room is also subject to appreciable water infiltration originating from both substantial leaks in the pool shell, deck and groundwater in the soil surrounding the sub-grade room.

Prior to repairs completed earlier in 2015, water tended to pond in depths of up to 1/2" and could also be observed spouting from the room's sidewalls and ceiling during significant rain events. The presence of water in the room presented a serious risk of accidental electrical discharge and injury to the pool's staff. In spring 2014, at the recommendation of the City of



Top:  
Long Meadow Pool with  
off-season pool cover installed.

Bottom:  
Aerial photo of Long Meadow Pool  
showing extent of Flood Plain  
(solid blue) and 1% Future  
Conditions Flood Plain (stripped  
aqua blue).



Durham's Risk Management Department, the pool was closed to public use until the hazardous conditions in the Pump Room could be remedied. Repair work to mitigate Pump Room water infiltration was begun in the fall of 2014. When those repairs are completed, the pool is to be reassessed to determine whether conditions have improved sufficiently to permit re-opening the pool in the summer of 2015.

### 3.22 Summary of Aquatic Features

The slopes of the bottom of the pool satisfy the requirements of the Health Code. The waterslide flume terminates into 3'-9" of water depth which is compliant with the code. The deck space intended for foot traffic is adequate around the waterslide and the full perimeter of the pool. The dry ramp located along the shallow end of the pool does not satisfy the ADA requirements for access and is a current deck obstruction and rainwater collector. Depth markings are spaced as required by the code but several are inaccurate and do not conform with code requirements.

Main drains are located at the deepest section of the pool as required by code and have VGB compliant main drain covers (30" x 30") rated for 1432 GPM each. Additionally, two VGB compliant main drain covers (30" x 30") rated for 1432 GPM are mounted on the wall of the pool. The wall-mounted main drain covers are connected to the water slide pump.

The gutter overflow system has an inner tiled face and measures approximately 13" wide by 24" deep. The gutter is covered with a PVC grate that is continuous around the pool's perimeter. Intermittently, the gutter is interrupted by a valve control box that originally operated an in-floor sweep and water supply system. As part of the ongoing repairs to the pool shell, the gutter has been re-plastered and the valve control boxes, underfloor sweep and water supply system replaced by a new, sidewall inlet system. A vacuum system, also no longer operational, has been removed.

Top:  
Long Meadow Pool Pump Room showing evidence of water infiltration including floor ponding, rust and corrosion.

Bottom Left:  
Pool water supply valve control box inserted into the gutter grate.

Bottom Right:  
Gutter cavity with supply water piping during investigative demolition.



The Pump Room for Long Meadow is located below grade at the end of the original pool shell. As previously noted, the Pump Room is perpetually wet as water enters the space from a variety of sources. The primary sources of water are believed to be leaking pool water, water from a clogged stormwater pipe and ground water. Due to the continued flow of water into the Pump Room, two sump pumps have been installed, the second sump pump serving as a backup response to failure of the primary sump pump. Even with the sump pumps in place and operating, there is water and algae growth on the room's floor.

The pool recirculation pump and strainer are both in good condition as both have been replaced due to recent flooding. Piping systems for the pool are schedule 40 PVC. The pool filtration system consists of four Pentair TR-140 fiberglass filters, which are in good condition. The filter backwash is routed out of the pool mechanical room to a sanitary backwash. The filtered water recirculation piping splits from a 6" pipe to two 4" pipes that feed re-circulated water to inlets from both sides of the pool.

The maximum filtration rate per the four TR-140 C3 filters is 106 gpm, well within the code requirement of a filtration rate not to exceed 15 gpm/sq. ft of filter. Therefore the maximum recirculation rate for the pool system based upon the size limitations of the filtration system is 424 gpm.

The waterslide has its own pump and piping system. Two wall drains have been cut into the pool shell from which suction piping is routed to the Pump Room where the two independent pipes tee together on the suction side of the waterslide pump. After the pump, return piping routes below grade and then vertical up the waterslide start tower connecting to the waterslide start tub. The waterslide pump and piping system are in good condition.

The pool water fill is a manual system with a control valve located in the pool equipment room and an over-the-rim fill pipe at the pool deck. The Pump Room has an operable ventilation and exhaust system.

The pool chemicals utilized for sanitation and pH balance of the pool are sodium hypochlorite and carbon dioxide. The pool chemicals and chemical feed systems are located in the above-grade Chemical Storage Room. These systems are in good condition. The Chemical Storage Room has code-compliant natural ventilation. The water chemistry controller is a Bec-SYS 3 system that is located in the mechanical room and is in good condition. Electrical service to the Pump Room has been updated and it is in excellent condition.

### 3.23 Operating Costs

Recent, annual operating and maintenance costs at Long Meadow Pool for the 2014 season are as follows:

Personnel (FY 2014)	\$30,890
Operating* (FY 2014)	\$ 9,290
<u>Maintenance Costs (Calendar Year 2013)</u>	<u>\$ 6,084**</u>
Total	\$46,264

### 3.24 Annual Maintenance Allowance Recommendation

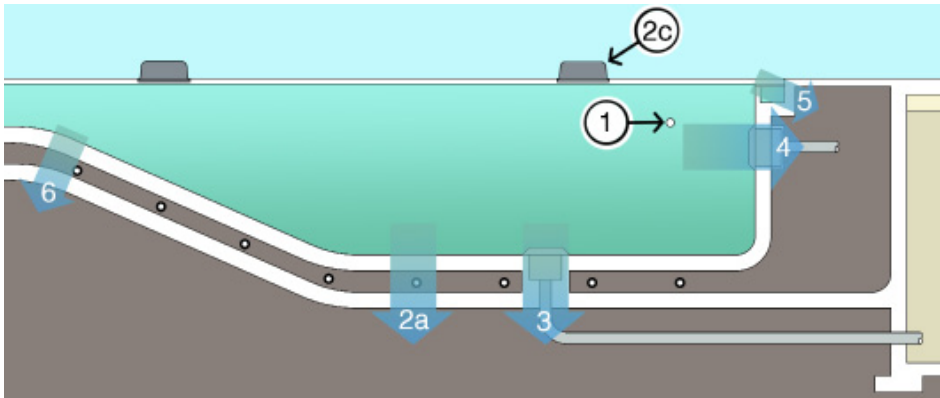
Based on the age of Long Meadow Pool and its location in the floodplain and assuming each of the repair and renovation recommendations included in this report is addressed, the Design Team recommends that thereafter an annual maintenance allowance of \$20,000 be allocated.

### 3.25 General Assessment

Long Meadow Pool is approximately 40 years old, which is beyond the aquatics industry standard of a 30-35 year service life for an outdoor swimming pool. The pool's original concrete shell is now concealed by the 80s era concrete shell liner, cannot be accessed for inspection and may have significant structural defects. The inner shell shows evidence of considerable hairline cracking, particularly in the pool's deep end.

\* Operating costs include utilities, equipment and expendable supplies.

\*\* The 2013 tally of maintenance costs is not reflective of the average annual costs for this pool in the past decade. From 2007 through 2012, \$139,000 has been invested in repairs and renovations of the facility, for an average annual maintenance cost of \$23,169.



The pool's location in a flood plain prohibits the kind of improvements that would be necessary to significantly extend its life. Water leakage from the pool shell is substantial: 4" to 8" of water loss per day. While current efforts to repair this leakage may be successful, a shell of this age will continue to be prone to settlement, making it highly susceptible to developing new leaks. And while the problem of water infiltration into the Pump Room and its attendant electrical hazard is also currently being addressed, these efforts do not have a high probability of success. *At best, this report's recommended renovations may extend the facility's life for up to five more years. Thereafter the pool should be decommissioned and funding budgeted for its replacement*

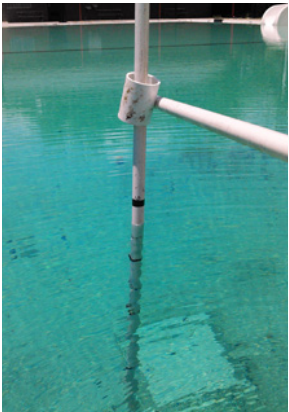
### 3.26 Keyed Renovation and Repair Notes

#### LM.1 and LM.2/Code Violation – Pool Shell Leakage

The pool shell has been observed to leak approximately 4" to 8" of water per day during the summer season. Because this leakage is one source of water entering the Pump Room and contributes to the room's electrical hazard, this deficiency is categorized as a code violation.

In the fall of 2014, the shell was leak tested. Six likely areas of leakage were initially identified and repaired. A subsequent test of the shell's watertightness identified a seventh area of leakage in the pool's perimeter gutter. The gutter has since been stripped of its original tile and plaster lining, thoroughly cleaned and a new cement grout and waterproof plaster finish (Diamond Brite) applied.

Concurrent with the gutter repair, the existing, under-shell water supply system was abandoned, its associated piping removed and its 90 water inlets capped and plastered over. In addition, a number of cracks in the pool bottom were repaired and a new hydrostatic relief valve was installed. The pool is to be retested for watertightness following the completion of the current phase of repairs in the spring of 2015.



Top:

Schematic cross section of pool showing original and 1980 shell.

Identified sources of leakage:

1. Sidewall vacuum pipe
- 2a. Inlet piping
- 2b. Other inlet pipes (not shown)
- 2c. Piping at valve box
3. Pool bottom drain
4. Sidewall drain
5. Gutter
6. Shell cracks

Left:

Water loss monitoring stake showing an 8" drop in water level over three and one half days.

Right Middle:

Gutter lining demolition and installation of new water inlet pipe.

### 3.0 Facility Assessments Long Meadow Pool

Left:  
New shelter erected over open  
Pump Room stairwell..

Below:  
Preliminary mapping of deck storm  
drain inlets and lines (assumed,  
prior to field survey)

1. Storm drain deck inlet.
2. Under deck drain line.
3. Drain line from parking lot.
4. Storm drain deck inlet.
5. Drain line under deck.
6. Field inlet.
7. Clogged or collapsed drain line.
8. Unrelated drain line.



Recommendation: The recommended pool shell leak repair work has been substantially completed at the time of this writing. If subsequent testing reveals additional leakage, further remedial measures may be necessary. At present, no cost for such remediations is included in the estimate of repair costs until it is determined whether additional repairs will be necessary.

#### LM.3/Code Violation – Deck Cracking

There are significant cracks in the pool's concrete deck, with many located in close proximity to the sub-grade Pump Room. Because rainwater permeates through these cracks, enters the Pump Room and contributes to the room's electrical hazard, this deficiency is categorized as a code violation. In addition, those cracks which exceed 1/4" in either depth or width represent a trip hazard and are therefore a violation of the Health Code.

Recommendation: As of this writing, significant cracks, other than hairline fractures, have been thoroughly caulked with aquatic grade sealant. Where necessary to ensure good sealant adhesion, cracks have been mechanically widened prior to caulking. This work was completed in February 2015.

#### LM.4/Code Violation – Open Stairwell to Pump Room

The exterior stairwell leading to the sub-grade Pump Room has no overhead covering. As originally designed, rainwater could freely enter the stairwell and proceed into the Pump Room through a doorway at the bottom of the stair. Because this rainwater enters the Pump Room and contributes to the room's electrical hazard, this deficiency is categorized as a code violation.

Recommendation: It is recommended that a simple metal shelter be erected over the stairwell to limit - though not completely preclude - rainwater from entering the stairwell. The shelter was installed in January 2015.

#### LM.5/Code Violation – Clogged Storm Drain Line

There are two stormwater inlets positioned flush to the concrete deck surface southeast of the pool and a third field inlet just east of the pool's perimeter fence. It is assumed these inlets were designed to collect both deck runoff and sheeting surface water originating from a steeply graded slope immediately southwest of the pool enclosure. These inlets were observed to be clogged and during significant rain events, stormwater would back up onto the pool deck. Concurrent with such rain events, an increase in Pump Room water infiltration was also observed.

In December 2014, a video inspection of this stormwater system revealed that the drain line serving these inlets had either collapsed or no longer existed. The replacement of this drain line - running to a daylight outfall into Goose Creek - was completed in April 2015.

Recommendation: This improvement, in combination with repairs to the pool's gutter, deck and the addition of the stairwell shelter, is intended to either eliminate or substantially reduce the present Pump Room water infiltration. If these measures are fully successful when evaluated in April 2015, Long Meadow Pool can be cleared to reopen for the summer 2015 season.

If the assessment of the Pump Room infiltration following the conclusion of these repairs concludes that the water infiltration has not been successfully mitigated, additional remediation measures will be undertaken. Two additional measures currently under consideration:

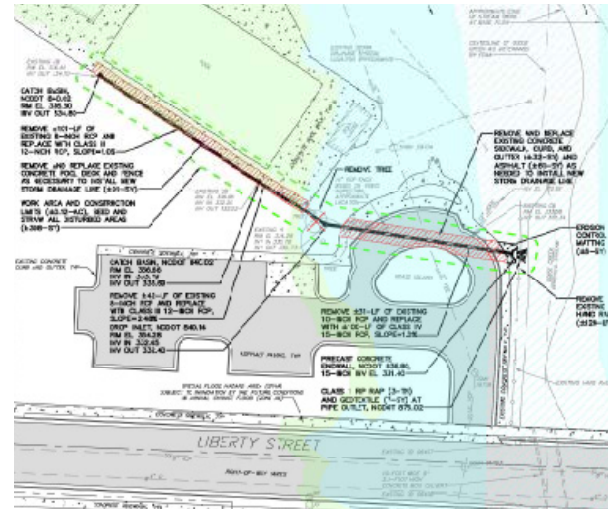
#### 1. Upgrades to the Pump Room Electrical System

During the original 2014 assessment of the Pump Room, a series of recommendations for improvements to the electrical system were developed by the design team's consulting engineer. These improvements (a full summary is included in the appendix of this report) would substantially reduce the risk of injury due to accidental electrical discharge, even if some reduced quantity of water continued to enter the Pump Room.

Some of these recommendations can be implemented by Facilities Operations personnel without need for engineering, permitting or bidding. The remainder of the recommendations would require engineering documents, an electrical permit and, likely, a bid process. The design, permitting, bidding and construction work could require approximately four to six months to complete. The estimated total cost of this work is approximately \$35,000, including all required engineering. This cost is not presently included in the overall estimate of repair costs for Long Meadow Pool.

#### 2. Water Infiltration from Sub-Grade Groundwater

It is assumed that one additional source of water infiltrating the Pump Room is groundwater (originating from a high elevation of grade southeast of the pool enclosure) that is moving southwest in the direction of Goose Creek. Below grade structures – both the pool shells at 10' below grade and pump room at 12' below grade – may act as an underground dam obstructing the flow of groundwater as it moves toward the creek. The resulting elevated hydrostatic pressure within this saturated soil forces groundwater to permeate through the walls of the Pump Room.



Left:  
Construction plan for replacement of clogged stormwater line at Long Meadow Pool by Stormwater and GIS Services Division, Public Works Department, City of Durham, North Carolina - Contract: SD-2013-01; Project COP-038.

If water infiltration into the Pump Room has not been successfully mitigated by the repairs described above, it is recommended that a foundation drain line be installed immediately outside the southwest enclosure of the pool. The design of this foundation drain would require detailed engineering consultation, including topographic and boundary surveying, a sub-surface soils investigation, hydrological studies defining the quantity, depth and path of groundwater, permitting and regulatory applications, preparation of bid documents and contract supervision. The work would need to be publicly bid. The project, including engineering and regulatory approval would require at least nine to twelve months to complete, pushing the potential re-opening of the pool to at least the 2016 summer season. A preliminary estimate for the cost of this work totals \$135,000 and is not included in the current Long Meadow Repairs Budget.

#### **LM.6/Code Violation - Non-ADA-Compliant Dry Ramp**

The facility's dry ramp is no longer permissible as an ADA-compliant means of accessing the swimming pool.

Recommendation: Install an ADA-compliant, battery operated lift on the deck near the shallow end of the pool. (Note: This work is to be completed in Mat 2015).

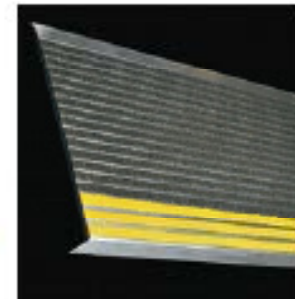
#### **LM.7/Code Violation – VGB Drain Covers**

During the 2014 pool leak test, one VGB drain cover was found to be damaged. The remaining three covers were in good condition. The broken cover was repaired and reinstalled. Approximately five years remain in the manufacturer's warranty for each cover.

Recommendation: Inspect the drain covers annually for signs of damage or deterioration. Prior to the end of the warranty period, replace with new covers.

#### **LM.8/Code Violation - Inaccurate Depth Markers**

Several of the pool's depth markings are inaccurate.



Top:  
Dry ramp.

Middle Right:  
Stairs showing deterioration of treads.

Middle Left:  
Inaccurate depth marker.

Bottom:  
Examples of replacement non-slip tread nosing covers.

Recommendation: Contract with a swimming pool technician to perform a detailed assessment of the accuracy and code-compliance of all existing depth and “No Diving” markers. The technician should prepare a cost estimate for satisfying the code’s requirements and perform replacement work as necessary. The use of inlaid ceramic tile markers is recommended.

#### **LM.9/Code Violation – Pump Room Exterior Stairwell**

The stairwell leading to the sub-grade Pump Room is steeper than would be permissible under the current Building Code. In addition, the stair treads are chipped, uneven and slippery when wet. The stairwell has no handrails.

Recommendation: The cost of rebuilding the stair to meet the code’s current requirements for rise and run would exceed UDO and FEMA limitations on expenditures for substantial improvements. The present stair tread depth and riser height, though excessive, is permissible as a grandfathered existing condition.

The damage to the stair treads should be repaired and a non-slip surfacing installed on each. New, code-compliant handrails should be installed on each sidewall of the stairwell. The rail anchorage should be carefully installed to preclude further opportunities for water infiltration.

#### **LM.10/Code Violation – Self-Closing, Self-Latching Gate**

The entrance gate to the pool enclosure is not self-closing nor self-latching. Although this Health Code requirement has been exempted by the pool’s inspector due to the presence of staff to monitor access during hours of operation, a similar provision of the Building Code does not allow for this exemption.

Recommendation: Install self-closing hinges and self-latching hardware on the existing entrance gate.

#### **LM.11/Code Violation – Chemical Storage in Flood Plain**

The minimum height of storage for all pool chemicals is to be two feet above the Future Conditions Floodplain, which equates

to approximately five feet, four inches (339.8’) above the Chemical Storage Room’s present floor elevation of 334.5.’ The existing ceiling height in this room is seven foot four inches above the floor. Accordingly, all stored chemicals will either need to fit within a vertical volume approximately two feet in height, or the ceiling and roof structure of the room will need to be modified to offer additional vertical clearance.

Recommendation: Shelving for the bulk storage of pool chemicals must be raised to a minimum height of 5’-4” above the Chemical Storage Room floor. Vessels containing pool chemicals must either be raised to a similar height, or if placed at a lower height, all openings into the vessels must be at a minimum height of 5’-4” above the floor and the vessels must be securely anchored to prevent dislodging during a flood event. Provisions to permit staff access to the elevated shelving will be required but may not be operationally practical.

***The existing height of the ceiling in this room is approximately seven feet. Elevating shelving and chemical vessels above the required minimum above-floor height may require significant ceiling and roof truss modifications, the cost of which will likely exceed UDO and FEMA restrictions on the value of repairs in the floodplain.***

#### **LM.12/Code Violation – Pool Turnover Rate**

The current pool water turnover rate is estimated to be 6.8 hours, which exceeds the Health Code’s maximum six-hour requirement. However, because Long Meadow was constructed prior to 1993, it is exempted from this requirement.

Recommendation: No action is required, although it should be noted that ongoing repair work to replace the water inlet system is expected to reduce the turnover time. A recalculation of the actual turnover rate will be made by the pool repair contractor once the current repairs are completed.

**LM.13/Age – Leaking Supply Valve**

The supply valve at Pump Room filter basket is leaking and difficult to fully close.

Recommendation: If the valve cannot be repaired by Facilities Operations staff, it should be replaced.

**LM.14/Maintenance – Misplaced Sight Port**

The Pump Room's backwash sight port glass was installed in an incorrect location, rendering it ineffective.

Recommendation: Rather than replacing the existing port, a new port should be installed in the correct location.

**LM.15/Maintenance – Missing CO<sup>2</sup> Manifold**

When the pool was closed for the 2015 summer season, the CO<sub>2</sub> manifold was removed for use in another facility.

Recommendation: Replace the missing CO<sub>2</sub> manifold.

**LM.16/Age – Pump Room Concrete Deterioration**

Severe water infiltration into the Pump Room from groundwater and chlorinated pool water has caused the room's concrete structural beams, ceiling slab and bearing walls to spall, leading to corrosion of exposed concrete reinforcing steel.

Recommendation: Patch all locations of spalled concrete in the Pump Room where either exposed rebars are present or there is visual evidence of staining from rebar corrosion. Prior to patching, remove areas of rust and corrosion from all exposed rebars with a wire brush.

**LM.17/Age – Water Slide Repair**

The steel structure of the water slide shows minor evidence of rust and corrosion. The resin outer of the slide's fiberglass flume has worn off in several areas.

Recommendation: The steel slide structure should be wire brushed to remove all loose rust and areas of corrosion. Paint all exposed steel surfaces with commercial grade epoxy paint. Areas of the slide flume's resin coating that have deteriorated should be patched and restored to a smooth finish.

Note: The slide flume could be completely refinished and a new resin coating applied. The cost of this work is estimated to be approximately \$40,000. If the life of the pool is extended beyond seven years, this repair should be included as a one-time expense in the pool's annual maintenance budget.

**LM.18/Age – Filter Sand**

It is recommended that filter sand be replaced at minimum every seven years, depending on the intensity of the pool's use. The sand in the filters at Long Meadow has not been replaced in recent memory.

Recommendation: The sand in each of the filters should be replaced.

**LM.19/Upgrade – Dry Ramp Infill**

The existing dry ramp is no longer ADA-compliant and is not used. Its position restricts the width of the deck and impedes patron access to the deck from the pool.

Recommendation: Infill the dry ramp and remove its handrail. It is anticipated this work will be undertaken at the same time as the replacement of the stormwater drain line (See LM.5).

**LM.20/Upgrade – Gate Access to Pump Room Stairwell**

Access to the Pump Room stairwell is through a gate located outside the pool's fenced enclosure. This position is both inconvenient and a safety risk for staff.

Recommendation: Facilities Operations staff is relocating the exterior gate to a position within the pool's enclosing fence.

#### **Site and Facility Security**

There have been a number of unauthorized, after-hours entries into this facility. Recommendations have been offered by staff to introduce security cameras or motion detectors.

Recommendation: At present, there is no comprehensive Parks and Recreation Department policy regarding a unified approach to security at its facilities. For example, if security cameras were provided at Long Meadow, it is unclear how such cameras would be monitored in real time and what impact their presence might have on the overall security of the facility.


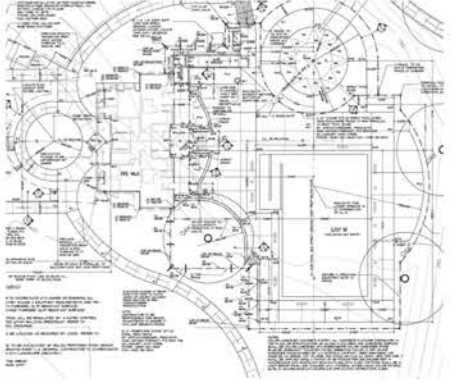



The Parks and Recreation Department is presently considering policy measures to address security at its other public facilities. It is recommended that the effectiveness of this initiative be reviewed to determine whether these findings can be adapted for the Department's aquatic facilities, including Long Meadow Pool.



Right:  
Exposed, corroded concrete beam  
in Pump Room.

Far Right:  
Minor rust and corrosion on water  
slide structure.



<h1>Hillside Pool</h1>	 
<p>Address 1300 South Roxboro Street Durham, North Carolina 27707</p>	
<p>Summary Description Outdoor seasonal rectangular swimming pool with adjoining sprayground</p>	
<p>Metrics</p> <p>Dimensions: 45' x 75'</p> <p>Perimeter: 264'</p> <p>Surface Area: 3,550 Square Feet</p> <p>Depth Range: 0' - 0" to 7' - 6"</p> <p>Estimated Volume: 122,446 Gallons</p> <p>Code Required Flow Rate: 340 GPM Estimated Flow Rate: 390 GPM (based on filter capacity)</p> <p>Code Required Turnover Rate: 6 hours Estimated Turnover Rate: 5.2 Hours</p> <p>Pool and Sprayground Season: 9 1/2 Weeks, June - August</p>	  
<p>Year of Construction 2000</p>	
<p>Major Renovation(s)</p>	<p>Shell: Concrete pool shell with plaster finish Gutter: Skimmer overflow system Sprayground: Surge Tank Volume: 3,060 Gallons; Code Required Flow Rate: 51 GPM; Provided Flow Rate: 216 GPM; Code Required Turnover Rate: 1 Hour; Estimated Turnover Rate: 1/4 Hour</p> <p>Notes</p>

## Facility: Hillside Pool

Priority	Ref	Issue	Category	Recommendation	Net Cost	Total Cost	Permit Req'd	A&E Design Req'd	Notes
1 Public Safety Code Compliance	1A.	Non-Compliant ADA Ramp	Code	Install ADA-Compliant Lift	\$ 8,000	\$ 9,600 (2)	No	No	HS.1
	1B.	VGB Drain Covers	Code	Replace	\$ 2,500	\$ 3,000 (1)	No	No	HS.2
	1C.	Inaccurate, Depth Markers	Code	Inventory and Replace Inaccurate, Inconsistent Markers	\$ 2,500	\$ 3,450 (2)	No	No	HS.3
	1D.	Perimeter Fence. Gaps in Excess of Code	Code	Regrade at Fence Permitter to Close Gaps Due to Grade Loss	\$ 3,000	\$ 4,140 (2)	No	No	HS.4
	1E.	Rest Room Handrails	Code	Provide 2 Vertical Grabbars	\$ 900	\$ 1,242 (2)	No	No	HS.5
	2A.	Pool Shell Leakage	Age	Perform Dye Test, Repair Skimmers and Floor Cracks	\$ 35,000	\$ 53,130 (3)	No	Yes	HS.6
	2B.	Ponding on Deck	Age	Install Linear Deck Drain	\$ 6,000	\$ 9,108 (3)	No	Yes	HS.7
	2C.	Security. Unauthorized Access via Stump	Maintenance	Remove Stump	\$ 1,000	\$ 1,380 (2)	No	No	HS.8
	2D.	Deck Finish	Age	Sandblast and Seal	\$ 22,000	\$ 30,624 (2)	No	No	HS.9
	2E.	Sprayground Overspray	Maintenance	Assess, Adjust and Repair	\$ 2,000	\$ 2,760 (2)	No	No	HS.10
	2F.	Sprayground Plumbing	Age	Repair Chlorine Feed Replace Multi-Port Valve	\$ 2,800	\$ 3,864 (2)	No	Yes	HS.11
	2G.	Deck Shower Valve	Age	Replace Valve	\$ 800	\$ 1,104 (2)	No	No	HS.12
	2H.	Filter Sand	Age	Replace	\$ 2,000	\$ 2,760 (2)	No	No	HS.13
	2I.	Plaza Tile and Graffiti	Age	Repair Tile, Remove Grafitti	\$ 2,000	\$ 2,760 (2)	No	No	HS.14
	2J.	Slow Running Sanitary Line	Maintenance	Clean Sanitary Line	NA	NA			HS.15
	2K.	Ramp Rail Corrosion	Maintenance	Remove Corrosion, Repaint	\$ 800	\$ 1,104	No	No	HS.16
	2L.	Tree Roots Under Pool Deck Slab	Potential Maintenance	Monitor Deck Slab for Cracking Remove and Replace If Necessary	NA	NA			HS.17
3 Building and System Upgrades	3A.	Security/Cashier	Upgrade	Install Mirror at Cashier Counter	\$ 500	\$ 690 (2)	No	No	HS.18
	3B.	Overall Site Security	Upgrade	Coordinate Enhanced Security Measures with Other P & R Facilities	NA	NA			HS.19
	3C.	Inadequate Wayfinding	Upgrade	Provide Directional Signage	\$ 4,000	\$ 6,072 (3)	Yes	Yes	HS.20
4 Exterior and Interior Refurbishment	4A.	Site Landscaping	Aesthetics	Replace Trees	\$ 2,000	\$ 2,769 (2)	No	No	HS.21
	4B.	Bathhouse Windows	Aesthetics	Address Missing Windows	NA	NA			HS.22
TOTAL ESTIMATE OF PROBABLE COST						\$139,548			
Keyed Notes (1). 20% Contingency (2). 20% Contingency + 15% P and O (3). 20% Contingency + 15% P and O +10% A and E Fee (4). 20% Contingency + 15% P and O + 40% A and E Fee									
						<div></div> Denotes Completed Work			

### 3.3 Hillside Pool

#### 3.31 Overview

Hillside Pool is a medium sized rectangular pool with a flanking zero-depth entry, ramp built in 2000. It has an adjoining, though separately fenced sprayground area within the pool enclosure area. There is a split-faced block Bathhouse that also contains a Cashiers Station, Staff Room, Pump Room and Chemical Storage Room.

#### 3.32 Summary of Aquatic Features

The pool shell ranges in depth from 0'-0" to 7'-6." Its slopes conform to current requirements of the code. There are two 18" x 18" main drains that are located at the deepest section of the pool as required by code and are VGB compliant. There are eleven recessed skimmers that satisfy the code requirement for water recirculation. Each has tapered tile throat openings.

The pool deck is a concrete deck with a painted, non-slip finish. The sprayground is circular with a multi-colored cool deck pattern, four above grade features and multiple at grade features. The sprayground surfacing and features are in good condition.

The pool mechanical room is very tight on equipment room space, but the equipment is in good condition given its age. There are independent recirculation systems for both the pool and the sprayground. Each water system has a BecSYS 3 water chemistry controller that controls the liquid chlorine and carbon dioxide injection to the recirculation system maintaining balanced water chemistry. The liquid chlorine and carbon dioxide are stored in a dedicated pool chemical room with an emergency eyewash/shower unit.

The main pool filter is a Stranco FF-34-110, Serial 1000-225. The provided operational filtration rate for the single high rate sand filter is 390 gpm, which is within the code requirements. The pool electrical systems and all systems in the Pump Room are in good condition with no visible corrosion indicating good



air quality within the room. The sprayground filter is a Stranco FF-34-61, Serial 1000-146. There is a locked, below grade surge tank located outside of the fenced pool deck area. The volume of the surge tank is approximately 3,060 gallons and the recirculation system for the sprayground draws water from the surge tank. The water from the sprayground gravity flows from the drains at the sprayground to the surge tank. The sprayground play equipment is operated via a controller that the maintenance staff programs to operate for the feature sequencing.

3.33 Operating Costs

Recent, annual operating and maintenance costs at Hillside Pool are as follows:

Personnel (FY 2014)	\$29,007
Operating* (FY 2014)	\$ 6,275
Maintenance Costs (Calendar Year 2013)	\$ 7,603
<hr/>	
Total	\$42,885

\*Operating costs include utilities, equipment and expendable supplies.

3.34 Annual Maintenance Allowance Recommendation

Based on the age of Hillside Pool and assuming each of the repair and renovation recommendations included in this report is addressed, the Design Team recommends that thereafter an annual maintenance allowance of \$10,000 be allocated.

3.35 General Assessment

Although Hillside Pool, its sprayground and its support structures are in reasonably good shape given their age, the pool shell has been reported to leak in volumes that vary depending on the season and use. Continued leakage risks undermining the structural integrity of the shell and should be more carefully investigated. The pool is also functionally limited in providing aquatic recreation to patrons. Unfortunately water depths

between 5'-0" to 7'-0" provide little water programming value and are not deep enough to allow deep water recreational activities. The addition of recreational program features such as water basketball or floatable features in the shallow water area of the pool would greatly enhance the facility's appeal to patrons and is recommended. Nevertheless, Hillside should continue to serve as an effective aquatic facility for several more decades and it is considered highly cost effective to make all of the repairs needed to bring the facility up to the current code and usage requirements.



Top:  
The sprayground is within the general pool enclosure area and is available for use only when the Hillside is open.

Bottom:  
Accessible ramp from pool deck to bathhouse.

### 3.36 Keyed Renovation and Repair Notes

#### HS.1/Code Violation – ADA-Compliant Pool Access

The sloped entry ramp into the pool and the transition between the sloped entry and the pool both exceed the allowable maximum slope and there is only a single handrail instead of the two required.

Recommendation: It is not economically practical to reconstruct this ramp to bring it into compliance with the code. Moreover, the ramp remains a useful, zero-depth access for non-impaired pool patrons and therefore should be retained. An ADA-compliant lift should be installed on the deck near the shallow end of the pool in the southeast corner. A battery-operated lift is recommended.

#### HS.2/Code Violation – VGB Drain Covers

The present VGB drain covers are damaged and should be replaced. Their present warranty expires in 2017.

Recommendation: Contact the VGB drain supplier (Water Ways) to determine whether the damage is still covered by warranty. If it is covered, request repair or replacement by supplier. If the damage is not covered, provide new VGB drain covers.

#### HS.3/Code Violation – Depth Markers

Several of the depth markings are inaccurate and do not conform to code depth marking requirements. The change in slope at the bottom of the pool is marked with a 4" blue tile band along the wall and floor, but is located at a depth greater than 5 feet, which is a code violation.

Recommendation:

Contract with a swimming pool technician to perform a detailed assessment of the accuracy and code-compliance of all existing depth and "No Diving" markers. The technician should prepare a cost estimate for satisfying the code's requirements including



Top:  
Non-compliant pool entry ramp.

Middle Left:  
Cracked skimmer housing.

Middle Right:  
Gap at bottom of enclosure fence,  
in excess of code maximum of 2."

Bottom:  
Water mark at center of image in-  
dicates location of ponding water.

proper placement of the change in slope tile line, and perform replacement work as necessary. The use of inlaid ceramic tile markers is recommended.

#### **HS.4/Code Violation – Perimeter Fence**

There is some soil erosion along the perimeter pool enclosure fence on the south side of the deck. A gap at the bottom of the fence now exceeds the Health Code's two-inch maximum vertical clearance between grade and the bottom of the barrier.

Recommendation: In areas of the perimeter fence where the existing grade has receded, provide compacted fill as necessary to return grade to a height less than two inches below the bottom of the perimeter fence. Provide slope retaining elements – for example, a railroad tie retaining structure, anchored to the grade with lengths of rebar – as necessary to stabilize the compacted soil.

#### **HS.5/ Code Violation – Rest Room Handrails**

Vertical handrails in accessible toilet stalls are required by the current ADA.

Recommendation: Provide one vertical handrail in each designated accessible toilet stall if presently not provided.

#### **HS.6/Age – Pool Shell Leakage**

There is some water leakage from the pool shell, totaling as much as 4" to 6" of water depth per day to as little as ½" per day, depending on season and use. It is presumed that some portion of this water has accumulated in the soil beneath the pool and may eventually contribute to a deterioration of the pool shell's structural integrity. Also of note, a large hardwood tree was removed just outside the south pool fence. Roots from this tree are likely to remain in the vicinity of the pool shell and their gradual decay could impact the structure of the shell over time.

An initial pressure test of the pool's piping determined there

were no leaking or broken pipes in the supply and return water system. The testing technician did note a number of cracks and missing sealant in four of the pools eleven skimmers, which is likely contributing to the reported water loss. In addition, there are a number of significant cracks in the bottom of the pool shell that are also likely to be a source of water leakage. A dye test to determine the extent of leakage through these cracks has not been performed at the time of this writing.

Recommendation: The pool shell should be dye tested to determine the location and extent of water leakage through cracks in the bottom of the pool. If renovation work occurs more than a year after the original pressure testing of the piping (December 2014), this test should be repeated. On the basis of the test results, the identified sources of water leakage should be repaired. The four skimmers should be rebuilt and resealed, and all shell bottom cracks should be filled and sealed. At the time of this work, the skimmer floats and other related hardware in all eleven skimmers are either missing parts or are damaged and should be replaced. Following repairs, a re-assessment of the watertightness of the shell should be undertaken. If further water loss is observed, a second series of repairs may be necessary.

In addition, the pool shell in the vicinity of the tree roots should be monitored in the coming years for evidence of increased cracking and/or settlement due to the decomposition of the roots.

#### **HS.7/Age – Deck Ponding**

Both rainwater and pool water oversplash ponds on the deck area south of the pool shell. The accumulated runoff also contributes to an increase in erosion on the southern edge of the pool enclosure.

Recommendation: Place a linear drain and cover grate in the deck south of the pool shell, running east to west at the midpoint between the pool edge and the south enclosure fence. Pipe the collected water to a daylight outfall south of the pool enclosure.

#### **HS.8/Maintenance - Tree Stump**

A large tree stump immediately outside the pool's enclosure fence on the south offers a stoop that aids unauthorized access over the barrier.

Recommendation: The stump should either be removed or cut back to preclude its use as a stepping stoop. The grade in the vicinity of this stump is too steep to permit access for a conventional mechanized stump grinder. As an alternative, the stump can be broken down with the use of chemicals or by burning. Either of these methods will require the removal of the remaining, degraded portions of the stump by hand.

Note: There are other locations of the enclosing perimeter fence where unauthorized access has occurred, aided by the proximity of trees adjacent to the fence. Short of removing these trees or making the fence much taller, there is no cost effective remediation for this problem.

#### **HS.9/Age – Deck Finish**

The pool deck is a concrete slab with a non-slip painted coating. The paint coating is wearing through in multiple locations. In addition, the painted finish is difficult to clean and maintain. Staff would prefer to have un-surfaced concrete instead of a deck surfacing material.

Recommendation: Sandblast the original finish down to the surface of the underlying concrete. Care should be taken to preserve sufficient grit in the resulting concrete surface to provide good slip resistance without creating an abrasive texture that could injure patrons.

#### **HS.10/Maintenance – Sprayground Overspray**

The sprayground surfacing and features are in good condition, however the feature sprays are operating at an excessive velocity, resulting in overspray, reducing overall system pressure and contributing to the loss of water and treatment chemicals.



Top:  
Tree stump immediately outside  
pool enclosure fence.

Middle Left:  
Deteriorating pool deck finish.

Middle Right:  
Rusting handrail at ramp.

Bottom:  
Entrance seating feature.

necessary adjustments and repairs as required to eliminate the overspray.

#### **HS.11/Age – Sprayground Plumbing**

There is a leak in the sprayground filter multi-port that is increasing over time. The chlorine pump line is no longer operational, requiring chlorine for the sprayground to be hand fed.

Recommendation: Replace the leaking multi-port valve. Engage chemical control manufacturer's technician to diagnose operation of the chlorine feed problem. Repair as required.

#### **HS.12/Age - Deck Shower Valve**

The deck shower generally operates, however its control is frequently stuck in the "on" position, which is both a waste of water and a source of clogs in the deck drain.

Recommendation: Repair or replace the shower valve. Check the deck drain for clogs and clear if required.

Note: Though the use of a deck shower in lieu of interior bathhouse showers is code-compliant, it is generally viewed in the aquatic industry as less desirable.

#### **HS.13/Age – Filter Sand**

It is recommended that filter sand be replaced at minimum every seven years, depending on the intensity of the pool's use. The sand in the filters at Hillside has not been replaced in recent memory.

Recommendation: The sand in each of the filters should be replaced.

#### **HS.14/Age – Pool Exterior Entrance**

The broken and missing tile on the exterior seating feature outside the pool's exterior entrance has been removed and replaced with concrete, however there remain areas of missing tile in the plaza area inside the seating circle.

Recommendation: Replace the missing tile in the plaza deck surface, either with new tile or concrete patching. Depending on the depth of the etched graffiti in the sidewalk, either grind to smooth finish or patch with concrete topping.

#### **HS.15/Age – Sanitary Sewer**

The sanitary sewer line has backed up into the bathhouse several times during the 2014 season.

Recommendation: Test all sanitary drain lines for clogging. Clear as necessary.

#### **HS.16/Maintenance – Ramp Rail Corrosion**

The handrail of the accessible ramp leading from the pool deck to the bathhouse is rusting.

Recommendation: Sand all rusted area to metal surface. Wire brush all remaining painted surfaces. Repaint the rail with epoxy paint.

#### **HS.17/Maintenance – Under Deck Tree Roots**

As previously noted, a large hardwood tree was removed just outside the south pool fence. Roots from this tree are likely to remain beneath the pool deck. At present, there is no indication that the presence of these roots or their possible decay has led to settlement or cracking of the deck surface. However, it is possible that in time, the decomposition of the roots could impact the structural integrity of the deck's concrete slab.

Recommendation: The deck in the area of the tree roots should be monitored periodically for evidence of increased cracking and settlement due to the decomposition of the tree roots. Minor cracking that represents a trip hazard should be repaired and filled with sealant. If the cracking and settlement become too severe for minor repairs, this section of deck, its underlying fill and the remaining tree roots should be removed and new compacted fill and concrete deck placed in all affected areas.

#### **HS.18/Upgrade - Cashier Visibility and Security**

There is a lack of visibility for the cashier to see individuals approaching the point of admission. This is both an operational deficiency and a security issue.

Recommendation: Increase visibility with an overhead convex mirror positioned to permit the cashier to see approaching individuals.

#### **HS.19/Upgrade – Site and Facility Security**

There have been a number of unauthorized, after-hours entries both onto the pool's exterior deck enclosure and into its Bath-house. In addition, the facility is perceived to be less secure than other Durham facilities during its hours of operation. A number of recommendations have been offered by staff, including provision of security cameras or motion detectors.

Recommendation: At present, there is no comprehensive Parks and Recreation Department policy regarding a unified approach to security at its facilities. For example, if security cameras were provided at Hillside, it is unclear how such cameras would be monitored in real time and what impact their presence might have on the overall security of the facility.

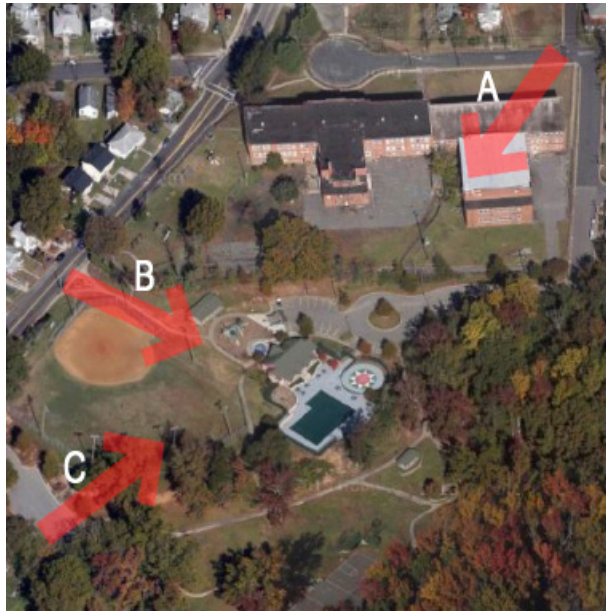
The Parks and Recreation Department is presently considering policy measures to address security at its other public facilities. It is recommended that the effectiveness of this initiative be reviewed to determine whether these findings can be adapted for the Department's aquatic facilities, including Hillside Pool.



Top:  
A. Cashier's window.  
B. Path of patron circulation out of view of cashier.

Bottom:  
Planting area northwest of pool that was location of a removed tree.





Top:  
Aerial view of Hillside Pool showing points of access from public streets.



Bottom:  
Unfinished plywood infill panel at window opening.

#### **HS.20/Upgrade – Wayfinding Signage**

Hillside Pool is not visible from either of the public streets providing access to Hillside Park. Vehicular access to the pool's parking area is neither obvious nor well marked.

Recommendation: Provide well-designed identification and directional signage positioned in conspicuous locations at the edge of the park, adjacent to both streets that provide patron vehicular access to the pool.

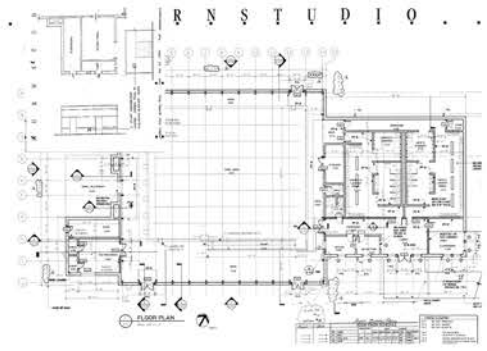



#### **HS.21/Aesthetics – Landscaping**

The removal of a significant existing hardwood tree in a landscaped area southwest of the Bathhouse has resulted in a loss of shaded areas on the deck and a deterioration of the quality and character of the site's exterior environment.

Recommendation: Provide replacement landscaping in this area, including the planting of one or more large evergreen trees. Constructed shade structures might also be provided on deck, but this feature is presently not included in this report's estimate of costs.

#### **HS.22/Aesthetics – Bathhouse Windows**

A window opening into the Women's Locker Room has been infilled with an unpainted plywood panel over a Plexiglas panel. At minimum, the plywood should be painted. Preferably, the windows should be restored with break-resistant obscure glass or durable, translucent Plexiglas. As this renovation is primarily aesthetic in nature, it could be deferred indefinitely. Accordingly, no opinion of probable cost is included in the repair and renovation budget.

<h1>Edison Johnson Aquatic Center</h1>	
<p>Address 500 West Murray Avenue Durham, North Carolina 27704</p>	
<p>Summary Description Indoor year-round rectangular swimming pool with remote sprayground</p>	
<p>Dimensions: 60' x 75' Perimeter: 274' Surface Area: 4,668 Square Feet Depth Range: 3' - 6" to 9' - 0" Estimated Volume: 205,754 Gallons</p> <p>Code Required Flow Rate: 608 GPM Estimated Flow Rate: 700 GPM (based on filter capacity) Code Required Turnover Rate: 6 Hours Estimated Turnover Rate: 4.9 Hours</p> <p>Pool Season: Year-Round Sprayground Season: 19 Weeks - May - September</p>	  
<p>Year of Construction 1993</p>	
<p>Major Renovation(s) 2001 - Sprayground construction 2004 - HVAC equipment replacement</p>	<p>Shell: Concrete pool shell with epoxy paint finish Gutter: Continuous rollout gutter perimeter overflow system with PVC grating Sprayground; Potable water flow discharging into sanitary sewer. Water is not recirculated.</p> <p>Notes</p>

Facility: Edison Johnson Aquatic Center									
Priority	Ref.	Issue	Category	Recommendation	Net Cost	Total Cost	Permit Req'd	A&E Design Req'd	Notes
1 Public Safety Code Compliance	1A.	Non-Compliant ADA Pool Access Rail	Code	Provide Complaint Rail on South Side or Ramp or ADA Lift	NA	\$ 6,500 (2)	No	No	EJ.1
	1B.	Inaccurate, Depth Markers	Code	Inventory and Replace Inaccurate, Inconsistent Markers	\$ 2,000	\$ 2,760 (2)	No	No	EJ.2
	1C.	Rest Room Handrails	Code	Provide Vertical Grabbar	\$ 900	\$ 1,242 (2)	No	No	EJ.3
	1D.	Deck Obstructions Lifeguard Chair	Code	Relocate if Operationally Feasible	NA	NA			EJ.4
	1E.	Natatorium Lighting Inaccessible/Glare	Age	Provide New Natatorium Lighting	\$ 100,000	\$151,800 (3)	Yes	Yes	In lieu of new lighting relocate existing lamps \$30,360 EJ.6
2 Deferred Maintenance Aging Systems	2A.	HVAC System	Age	Replace Dehumidification Unit	\$ 410,000	\$622,380 (3)	Yes	Yes	EJ.5
	2B.	Operable Roof Panels	Age	Inspect and Secure Panel Rails	\$ 12,000	\$ 16,650 (2)	No	No	EJ.7
	2C.	Pool Shell Finish	Age	Paint Pool Shell	\$ 24,500	\$ 33,810 (2)	No	No	EJ.8
	2D.	Pool Deck Finish	Age	Sandblast and Seal	\$ 16,000	\$ 22,080 (2)	No	No	EJ.9
	2E.	Chemical Controller	Age	Replace	\$ 6,000	\$ 8,280 (2)	No	No	EJ.10
	2F.	Exterior Doors Without Seals	Age	Provide Door Seals	\$ 1,800	\$ 2,480 (2)	No	No	EJ.11
	2G.	Dual CO2 Manifold	Maintenance	Provide	\$ 1,000	\$ 1,380 (2)	No	No	EJ.12
	2H.	Concrete Stoops Undermined	Age	Rebuild and Secure Grade at All Ext. Stoops	\$ 2,000	\$ 2,760 (2)	No	No	EJ.13
	2I.	Damaged CMU Chemical Storage	Age	Clean, Patch and Paint Damaged CMU	\$ 1,500	\$ 2,070 (2)	No	No	EJ.14
	2J.	Minor Ext. Wall Cracking	Age	Monitor	NA				EJ.15
	2K.	Minor Roof Leakage	Age	Inspect and Repair as Necessary	\$ 4,000	\$ 5,520 (2)	No	No	EJ.16
	2L.	Structure Paint Peeling	Age	Monitor. No Action	NA	NA			EJ.17
	2M.	Corrosion Pool Equipment	Age	Clean/Routine Maintenance	NA	NA			EJ.18
3 Building and System Upgrades	3A.	No Pool Drain Bypass	Upgrade	Provide Bypass Piping	\$ 2,000	\$ 2,760 (2)	No	No	EJ.19
	3B.	Shower Valves	Upgrade	Replace Shower Valves	\$ 4,000	\$ 5,520 (2)	No	No	EJ.20
TOTAL ESTIMATE OF PROBABLE COST						\$887,992			
Keyed Notes (1). 20% Contingency (2). 20% Contingency + 15% P and O (3). 20% Contingency + 15% P and O +10% A and E Fee (4). 20% Contingency + 15% P and O + 40% A and E Fee									
					<div></div> Denotes Completed Work				

### 3.4 Edison Johnson Pool

#### 3.41 Overview

Edison Johnson is an indoor, year-round pool constructed in 1993. The Natatorium is enclosed with translucent roofing panels supported on a pre-engineered steel frame. Exterior walls of the Natatorium are single wythe, split face concrete masonry units. There is a support building immediately east of the Natatorium, constructed of load bearing CMU, which houses Rest Rooms, Shower and Changing Areas, Office Space and Admissions. A similar, though smaller structure on the west houses the pool's Pump Room and Chemical Storage Room. The facility's rectangular pool is 75 feet by 60 feet and is of a depth and length suitable for competition swimming. There is also an on-site sprayground located between the aquatic center and the Edison Johnson Recreation Center that operates for 19 weeks from May through September.

#### 3.42 Summary of Aquatic Features

The slope and depths of the pool bottom of the pool conform to the requirements of the Health Code. There is a zero-depth ramped entry for access to the pool water, though it is not fully compliant with all ADA requirements.

Depth and "No Diving" markers are placed as required by code but some are illegible or difficult to read. Main drains are located at the deepest section of the pool as required by code. Three VGB compliant main drain covers were observed at 9 feet of water depth. Each of these drain covers is warranted through 2025.

The gutter overflow system is continuous around the pool's perimeter and is covered with PVC grates. In a Natatorium, the HVAC and ventilation system play an important role in maintaining good indoor air quality and a non-corrosive environment. The temperature and relative humidity in the Natatorium continue to be an issue as the Pool Pak compressor does not operate as designed. Signs of corrosion are evident around



Top:  
Natatorium.

Bottom:  
Sprayground.

the Natatorium including bolts on the lifeguard stands, starting blocks and ladders as well as the drinking fountain. The deck space is marginal around the pool and the concrete deck finish is deteriorating in multiple areas.

The Pump Room is adjacent to the pool. The surge tank is located beneath the pool deck adjacent to the pool and the recirculation pump is located in a below-grade pump pit. The pool chemicals utilized for sanitation and pH balance of the pool are sodium hypochlorite and carbon dioxide. The pool chemicals and chemical feed systems are located in a dedicated pool chemical room.

The water chemistry controller is a Strantrol system 4 that is located in the mechanical room and is in good condition. Two Neptune Benson high rate sand filters (model 4872 SHFFG) are installed for the pool. Each filter has a maximum flow rate of 533 gpm. The filters are in excellent condition. The recirculation pump is a 15 hp Paco pump and is only in fair condition due to external corrosion on the pump and motor.

The electrical connections for the pool were all in good condition. There are two heating loop connections: one to the HVAC dehumidification unit and one to a gas fired pool boiler. The HVAC dehumidification system has not worked effectively in a number of years so all of the pool heating is coming from the dedicated pool boiler that is a Lochinvar CPN unit.

### 3.43 Operating Costs

Recent, annual operating and maintenance costs at Edison Johnson Aquatic Center Pool for the 2014 season are as follows:

Personnel (FY 2014)	\$369,938
Operating* (FY 2014)	\$ 94,275
Maintenance Costs (Calendar Year 2013)	\$ 9,684
<b>Total</b>	<b>\$473,897</b>

\*Operating costs include utilities, equipment and expendable supplies.

### 3.44 Annual Maintenance Allowance Recommendation

Based on the age of Edison Johnson and assuming each of the repair and renovation recommendations included in this report is addressed, the Design Team recommends that thereafter an annual maintenance allowance of \$25,000 be allocated.

### 3.45 General Assessment

At over twenty years of age, the Edison Johnson Aquatic Center remains a very well-maintained and valuable asset to the Parks and Recreation Department aquatics system. Its most pressing need is the immediate replacement of its dehumidification unit, which is presently operating far below the capacity required to maintain appropriate temperature and humidity levels within the Natatorium. The unit is at imminent risk of complete failure. In such a circumstance, the facility would be unable to continue operations. Replacement of this unit should assume a high priority in future capital improvement funding.



### 3.46 Keyed Renovation and Repair Notes

#### EJ.1/Code Violation – Pool Access Ramp Handrail

The pool's access ramp does comply with the ADA's slope requirements but it has only a single handrail instead of the two required.

Recommendation: Provide a code-compliant handrail.

Note: In lieu of adding a handrail, the Department may elect to provide a battery-operated lift while retaining the existing ramp for the ease of access for all pool patrons.

#### EJ.2/Code Violation – Depth Markers

Several of the pool's depth markings are worn, difficult to read, are inconsistently labeled with different letter sizes not conforming to the code requirements and must be repainted annually.

Recommendation: Contract with a swimming pool technician to perform a detailed assessment of the accuracy and code-compliance of all existing depth markers. The technician should prepare a cost estimate for satisfying the code's requirements and perform replacement work as necessary. The use of inlaid ceramic tile markers is recommended.

#### EJ.3/Code Violation – Rest Room Handrails

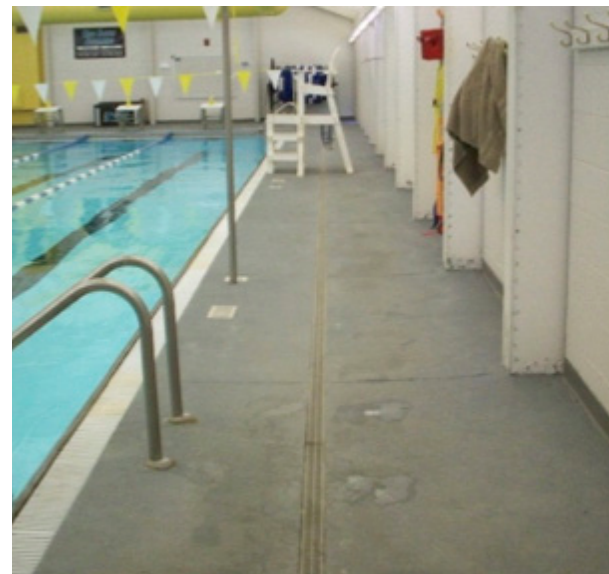
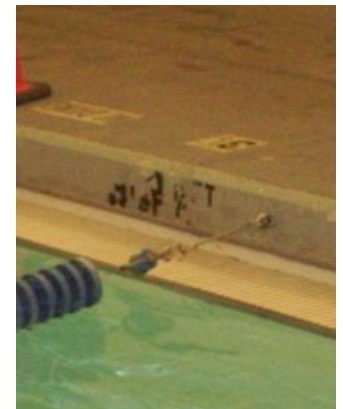
Vertical handrails in accessible toilet stalls are required by the current ADA.

Recommendation: Provide one vertical handrail in each designated accessible toilet stall.

#### EJ.4/Code Violation – Deck Obstruction

The code requires an unobstructed minimum deck width of five feet. The pool satisfies this requirement for all fixed obstructions, but the current position of the movable lifeguard chair along the north deck aisle is in violation of the intent of the code.

Recommendation: If it is operationally feasible and does not compromise lifeguard oversight of the pool, the lifeguard chair should be repositioned to an area of the deck with sufficient width to maintain five feet of clear circulation space.



Top Left:  
Pool access ramp requiring additional handrail.

Top Right:  
Illegible depth marker.

Bottom:  
Life guard chair obstructing minimum required deck width.

#### EJ.5/Age – Dehumidification System

The HVAC system at Edison Johnson is in extremely poor condition and in danger of failure. As a consequence, the Natatorium experiences poor air quality, inadequate air circulation and difficulty in maintaining appropriate temperature and humidity levels. *The conditioning unit is undersized for the use and capacity of the pool and is highly inefficient, resulting in excessive energy consumption.*

The facility is currently conditioned and dehumidified with a Dectron exterior pool dehumidifier unit (Dectron RSH 162-9) with a supplemental exterior HW boiler (Lochinvar CBN 1796, originally specified as a 1570 MBH input unit) and an air-cooled liquid cooler (Dectron CMD 051-5). The units were installed in 2004. The boiler originally was to provide heating for the pool water through the original heat exchanger, with some heating provided by the Dectron unit. Subsequent to the original installation, a larger boiler was installed with a HW coil added to the supply air ductwork to provide additional winter season heating.

The Dectron dehumidifier unit has two refrigerant circuits. Information from the maintenance staff indicates that one of the compressors is inoperable. The current refrigerant is R-22, a product that is being phased out due to environmental regulations and will no longer be readily available after 2020.

The unit has experienced multiple refrigerant leaks and exhibited signs of substantial corrosion on all components within the unit exposed to the air-stream. The corrosion indicates that the return air contains a significant portion of corrosive chloramines from the pool water. Information provided by the maintenance staff described return air inlets that were originally installed approximately two feet above the pool deck, which caused considerable corrosion of the original air handler.

The return air inlets were reworked in 2005 with an interior wall-mounted sheet metal plenum with the inlet louvers mounted at approximately eight feet above the deck. This relocation has improved the quality of the return air however, the corrosion of

the 10-year-old unit indicates that significant chloramines are still being returned to the unit. The higher level returns also will not assist in ventilating the air quality directly at the surface of the pool where chloramine concentrations will be highest.

Chloramine concentrations experienced at the pool have been cited by the Health Department but to date there is no concrete evidence that elevated levels of chloramines present a significant health risk. More typically, the concentration levels make the patron and staff experience uncomfortable with the most pronounced effects being the sense of eyes watering and burning, respiratory irritation and an unpleasant odor.

A brief review of the airflows specified in the documentation for the HVAC unit replacement in 2004 indicates that the unit airflow of 15,000 cfm provides an air turnover rate of 6.3 air changes per hour (ACH). This is within the ASHRAE recommended rates of between 4 and 6 ACH. A review of the specified fresh air rate of 2800 cfm, calculations indicate that this rate is below current ASHRAE recommendation of 3150 cfm based upon the area of the pool and a 6' wide "wetted" deck perimeter.

Recommendations: Based upon the very poor condition of the existing pool dehumidification unit and the phase out of R-22 refrigerant, it is recommended that the existing dehumidification be replaced. All coils and components in contact with the air stream should be provided with corrosion resistant coatings. The system should provide 100 % outside air capability for peak occupancies and purge capability.

In addition, the installation of a dedicated, low-level exhaust system to exhaust at the level of the water surface/pool deck is recommended. This new exhaust system will remove the low-level chloramine contaminants and allow fresh conditioned air to penetrate to the water surface, improving air quality for the pool occupants. By extracting the majority of the corrosive components from the return air stream, the low level exhaust should extend the life of the new dehumidification unit to its expected life span of 15 or more years. The exhaust system should include an energy recovery system. This work will also likely require an upgrade to the present electrical service.

This system will offer far greater efficiency in the conditioning of the space with considerably lower utility costs. The new dehumidification unit will have an expected service life of between 15 to 20 years. At the time of system design, a life cycle cost analysis should be prepared to confirm the magnitude of anticipated energy savings in relation to initial installations costs.

#### EJ.6/Age – Natatorium Lighting

Lighting for the Natatorium is provided by a series of 250 watt metal halide fixtures mounted to the underside of the roof structure. The fixtures are designed to provide indirect illumination to the pool area. The fixtures are inefficient by current energy use standards, show evidence of corrosion and are prone to overheating. Most of these fixtures are located over areas of the pool water that preclude lamp replacement without first draining the pool. Moreover, some fixtures are located over sloping portions of the pool shell, further complicating the erection of the scaffolding required for re-lamping. Finally, the current fixtures create glare on the surface of the water, making it difficult for lifeguards to adequately scan the pool bottom for hazards and patrons requiring assistance.

Recommendation: Replace the existing lighting system with fixtures positioned for easy deck access, rated for an aquatic environment, highly efficient and resistive to overheating. The illumination design should minimize glare on the pool water surface. An electrical service upgrade will also likely be required for this work.

A less costly alternative would only relocate the existing lamps to a position easily accessible from the pool's deck. This alternative is not recommended since it would not improve the efficiency of the fixtures, nor would it reduce pool water surface glare.

#### EJ.7/Age – Operable Roof Panels

The Natatorium is covered by a translucent roof supported on a steel frame. It features operable roof panels intended to promote



Top Left:  
Corrosion on HVAC coils.

Top Right:  
Natatorium roof panels.

Bottom Left:  
Light fixture located over pool  
shell, requiring drainage of the  
pool for relamping.

Bottom Right:  
Deterioration of deck finish.

structural load on steel cables that draw the panels into their open position, resulting in occasional cable failure. In addition, field observations indicate that the rails on which the panels glide are not securely anchored to the structure of the roof. During a significant wind event, it is even possible the tracks could be lifted off the roof when the panels are in the open position.

Recommendation: Although a roofing company has been inspecting the operable panels, motor and cables on an annual basis for the past three years, it is recommended that a qualified contractor with experience installing operable roofs of this type thoroughly inspect the roof and panels for deficiencies. It is also recommended that the original equipment manufacturer installation instructions be reviewed for proper installation procedure, particularly with regard to the secure anchoring of the panels to the roof structure. Until such time as the rails can be securely fastened to the roof, the panels should remain in the closed position. Inspection of the cables should also be a routine maintenance check. Stainless steel cables should be provided to inhibit corrosion of the cables.

#### **EJ.8/Age – Pool Shell Finish**

Maintaining the finish of the pool shell has been a recurrent problem at Edison Johnson. The shell was repainted twice in the most recent year, due to excessive finish peeling. In the past, the shell has been pressure washed prior to painting, however during the most recent repainting, staff performed an acid wash to prep the pool shell surface. The acid wash (or acid etching) added an additional week to the pool's annual two-week maintenance shutdown.

The etching process did not utilize the preferred muriatic acid wash due to use restrictions stipulated by Durham's Department of Risk Management. Instead, an acid substitute, generally used for stain removal, was applied. The subsequent paint finish already exhibits areas of bubbling, but no peeling as of yet. The Department would like options for extending the life of the finish or remedying the present causes of the finish deterioration.

Recommendation: Tnemec epoxy paint or its equivalent is recommended for a more effective and long-lasting pool shell paint finish. The existing shell surface should be sandblasted prior to any new painting. Instructions for the proper preparation of the shell surface are detailed in SSPCSP13/NACE 6, ICRI-CSP 2-4 Surface Preparation of Concrete and Tnemec's Surface Preparation and Application Guide, a copy of which is included in the appendix of this report.

#### **EJ.9/Age – Pool Deck Finish**

The pool deck is a concrete slab with a painted coating. The paint coating is peeling in multiple locations. Caulking joints between the deck slab and trench drains is missing in numerous locations. In addition, the painted finish is difficult to clean and maintain. Staff would prefer to have un-surfaced concrete instead of a deck surfacing material.

Recommendation: Sandblast the original finish down to the surface of the underlying concrete. Care should be taken to preserve sufficient grit in the resulting concrete surface to provide good slip resistance without creating an abrasive texture that could injure patrons. All joints between the slab and the trench drains should be re-caulked.

#### **EJ.10/Age – Stantrol Chemical Controller**

The Stantrol chemical controller is 20 years old and approaching the end of its effective service life. In addition, the Stantrol brand is no longer supported by its parent company, BECS. Repairs to this unit and replacement parts will become increasingly difficult to acquire.

Recommendation: The chemical controller should be replaced. Because chemical controller replacement is an issue that affects several other of the department's pools, staff should evaluate and then recommend a preferred manufacturer for all controller replacements, based on their assessment of performance, cost, reliability and technical support.

#### **EJ.11/Age – Exterior Door Seals**

Exterior doors leading into the Natatorium need replacement seals and weather-stripping to prevent air and water infiltration.

Recommendation: Provide new door seals and weather-stripping

#### **EJ.12/Maintenance – Dual CO<sup>2</sup> Manifold**

The chemical feed system's dual CO<sup>2</sup> manifold is deteriorating with non-functioning gauges.

Recommendation: Provide replacement manifold

#### **EJ.13/Age – Exterior Concrete Stoops**

Exterior concrete slab stoops outside each Natatorium exit door show evidence of settlement due to the erosion of soil, caused principally by rainwater runoff from the Natatorium roof. In time, the settlement will lead to cracking of the concrete and a separation of the stoop from the door threshold.

Recommendation: Where undermining of the pads is evident, provide re-grading as necessary, backfilling areas of visible soil loss with compacted #57 stone. If any pads have significant cracks as the result of undermining, patch as necessary. If the pad cracking is advanced beyond the ability to be repaired, or if the settlement creates a slope of 2% or greater, replace the stoop. To mitigate erosion in the future, provide a simple metal awning at each exterior door with guttering or scuppers to direct water away from the concrete stoop below.

#### **EJ.14/Age – Chemical Storage CMU Walls**

There is minor deterioration of the concrete masonry unit walls in the Chemical Storage Room.

Recommendation: The deteriorating CMU should be repaired with grout patching, or if necessary, the full replacement of



Top:  
Settlement of exterior  
concrete stoop.

Bottom:  
Typical corrosion of  
pool equipment.

Natatorium This is most likely due to expansion and contraction of the masonry wall. The cracks do not constitute a structural concern nor a source of water or air infiltration.

Recommendation: The cracks should be monitored on an annual basis. Should the cracking become more pronounced they should be closed with sealant and backing rods.

#### **EJ.16/Age – Minor Roof Leakage**

The roofing over the rest rooms was repaired in 2010. There have been leaks reported elsewhere in the facility including areas over the offices and locker rooms, and at the juncture between the Natatorium and the Pump Room. As of the summer of 2014, all leaks have been repaired.

Recommendation: The roof is presently inspected by Facilities Operations on a monthly basis. This practice should continue. In subsequent inspections, particular attention should be focused on the roof's juncture with the Natatorium enclosure. Verify all roof drains and overflow scuppers are operational and free of debris. Make minor roofing repairs as warranted.

#### **EJ.17/Age – Interior Painting**

The Natatorium's pre-engineered steel frame is galvanized and painted. The paint is beginning to fail at the base of the steel columns. There is still protection provided by the galvanization, therefore this issue is not critical at present.

Recommendation: Schedule painting of all steel members within the next five years as a precautionary maintenance task.

#### **EJ.18/Age – Corrosion on Pool Furnishings and Equipment**

There are varying degrees of corrosion of metal fittings at lifeguard chairs, starting blocks and other metal surfaces within the Natatorium.

Recommendation: At present, the corrosion is not jeopardizing the integrity of these elements however the corrosion should

be addressed as a matter of routine maintenance over the next several seasons. Spectra-Shield or another comparable product should be used to protect and clean stainless steel products found in the natatorium environment. Regular cleaning of the stainless steel should be part a routine maintenance protocol.

#### **EJ.19/Upgrade – Pool Drain Bypass**

There is no pool drainage line that bypasses the filtration system. Consequentially, during a pool drain cycle, all pool water must pass through the filters and a limited capacity surge tank. In addition, when the pool is being drained, the dehumidification unit must be shut off. Accordingly, there is no ability to condition the Natatorium during periods of annual maintenance, other than natural ventilation via open exterior doors and the operable roof panels. And, as previously noted, due to concerns for the anchorage of the roof panels, it is no longer recommended they be opened until the rails can be securely anchored.

Recommendation: Provide piping to by-pass the filters when draining the pool.

#### **EJ.20/Upgrade – Shower Valves**

In the bathhouse, showers are not equipped with commercial valves and frequently break and are difficult to repair because they cannot be turned off individually at the shower. The building water has to be shut off to make repairs to the showers.

Recommendation: Replace the shower valves with commercial-grade fittings. Provide a disconnect valve on the water line serving the showers.

# Campus Hills Aquatic Center

Address  
2000 South Alston Avenue  
Durham, North Carolina 27707

Summary Description  
Indoor year-round rectangular swimming pool

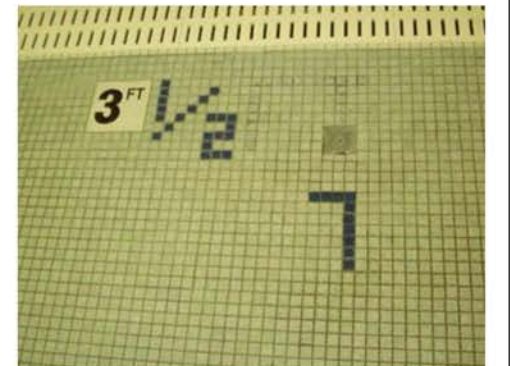
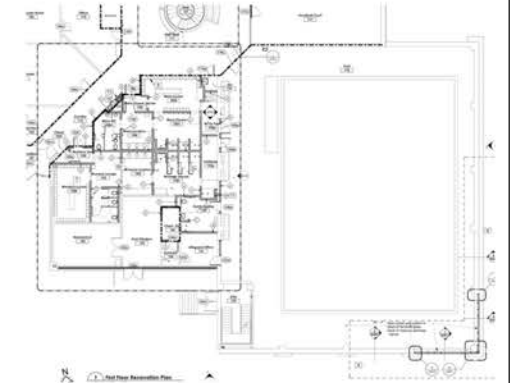
Metrics  
Dimensions: 52' x 75'  
Perimeter: 254'  
Surface Area: 3,900 Square Feet  
Depth Range: 3' - 6" to 7' - 0"  
Estimated Volume: 147,571 Gallons

Code Required Flow Rate: 409 GPM  
Estimated Flow Rate: 515 GPM (based on filter capacity)  
Code Required Turnover Rate: 6 Hours  
Estimated Turnover Rate: 4.8 Hours

Pool Season: Year-Round

Year of Construction  
1990

Major Renovation(s)  
2011 - Maintenance and accessibility upgrades



Shell: Concrete pool shell with epoxy paint finish  
Gutter: Continuous rollout gutter perimeter overflow system with PVC grating

Notes

Facility: Campus Hills Aquatic Center									
Priority	Ref.	Issue	Category	Recommendation	Net Cost	Total Cost	Permit Req'd	A&E Design Req'd	Notes
1 Public Safety Code Compliance	1A.	Non-Compliant Dry Ramp Pool ADA Access	Code	Install ADA-Compliant Lift		\$ 6,500	No	No	CH.1
	1B.	VGB Drain Covers	Code	Replace	\$ 2,500	\$ 3,000 (1)	No	No	CH.2
	1C.	Inaccurate Depth Markers	Code	Inventory and Replace Inaccurate, Inconsistent Markers	\$ 2,000	\$ 2,760 (2)	No	No	CH.3
	1D.	Rest Room Handrails	Code	Provide Vertical Grabbar in ADA Toilet Stalls (2)	\$ 900	\$ 1,242 (2)	No	No	CH.4
	1E.	Non-Compliant Deck Width	Code	Grandfathered - No Action	NA	NA			CH.5
	1F.	Hazardous Chemicals	Code	Reduce Quantity	NA	NA			CH.6
	1G.	Natatorium Lighting Sparking	Age	Provide New Natatorium Lighting	\$ 75,000	\$113,850 (3)	Yes	Yes	CH.8
2 Deferred Maintenance Aging Systems	2A.	HVAC System	Age	Replace Dehumidification Unit	\$475,000	\$721,050 (3)	Yes	Yes	CH.7
	2B.	Broken Deck Tile and Deck Ponding	Age	Replace Deck Tile	\$ 16,000	\$ 22,080 (2)	No	No	In lieu of full tile replacement, repair tile - \$5,520. CH.9
	2C.	Pool Shell Finish	Age	Paint Pool Shell	\$ 20,000	\$ 27,600 (2)	No	No	CH.10
	2E.	Stanrol Chemical Controller	Age	Replace	\$ 6,000	\$ 8,280 (2)	No	No	CH.11
	2E.	Sand Escaping Filters	Maintenance	Inspect Filters and Repair as Necessary	\$ 2,000	\$ 2,760 (2)	No	No	CH.12
	2F.	Maintenance Painting Wind Frame and Roof Deck	Maintenance	Paint	\$ 8,000	\$ 11,040 (2)	No	No	CH.13
	2G.	Minor Pool Leakage	Age	Monitor and Assess if Loss Becomes More Pronounced	NA	NA		CH.14	
	2H.	Minor Roof Leak	Age	Repair	\$ 5,000	\$ 6,900	No	No	CH.15
3 Building and System Upgrades	3A.	Infill Dry Ramp	Upgrade	Infill Dry Ramp.	NA	\$ 7,250	No	No	CH.16
	3B.	Spectator Occupancy	Advisory	Add Occupancy Signs	NA	\$ 50	No	No	CH.17
TOTAL ESTIMATE OF PROBABLE COST						\$934,362			
Keyed Notes (1). 20% Contingency (2). 20% Contingency + 15% P and O (3). 20% Contingency + 15% P and O +10% A and E Fee (4). 20% Contingency + 15% P and O + 40% A and E Fee									
						<div></div>	Denotes Completed Work		

### 3.5 Campus Hills

#### 3.51 Overview

Campus Hills Pool is the aquatic component of the Irwin R. Holmes Sr. Recreation Center, built in 1990. It is a 25-yard, rectangular competition pool that is used for swim meets, lap training, swimming instruction and recreation. The facility's Locker Rooms, Pump Room, Chemical Storage Room and Life-guard Office are located adjacent to the pool's deck level. There is a spectator mezzanine on an upper level overlooking the pool.

#### 3.52 Summary of Aquatic Features

Deck space in the Natatorium is extremely tight, with some areas less than the current code minimum width of five feet. The ceramic tile deck finish is uneven and does not completely drain in various locations around the deck drains and starting blocks.

The slopes of the bottom of the pool are code-compliant. At the time of the original inspection there was a dry ramp, which does not satisfy ADA requirements for access. Depth markings are placed at the points of maximum and minimum depths and spaced within the maximum distance of 25 feet apart as required by the code. Several of the depth markings are inaccurate, worn or hard to read and inconsistent with code requirements for legibility. Main drains are located at the deepest section of the pool as required by code and have VGB compliant drain covers. The gutter overflow system is covered with PVC grates and is continuous around the pool's perimeter. Sand can be observed throughout the gutter trough suggesting damage to the filter laterals.

The pool's recirculation pump is in good condition. The filter is operating efficiently, but may have damage to one or more of its laterals, causing loss of filtration sand. There are two National Filters, model 34-100-135-T, with each pool filter having a maximum flow rating of 270 gpm. The filter system has an automatic backwash system.



Interior and exterior view of the  
Campus Hills Natatorium.

water heat exchanger. The backwash sump pit is connected to the sanitary sewer. There is not a surge tank for the system so the pool is used to store surge as part of the surge capacity. The recirculation pump has direct suction from the pool gutter. The pool chemicals utilized for sanitation and pH balance of the pool are sodium hypochlorite and carbon dioxide. The pool chemicals and chemical feed systems are located in the dedicated Chemical Storage Room. The water chemistry controller is a Stranrol system 6, located in the mechanical room and is in good condition. The piping system is SCH 40 PVC and the recirculation pump is a 10 hp Sta-Rite that is in good condition.

The Chemical Storage Room stores multiple chemicals. Calcium Hypochlorite is not used at this facility, but 500 lbs. is stored here for use at other facilities. This amount exceeds the maximum allowed by the International Fire Code. In addition, appropriate chemical signage is not located on either the doors to the Chemical Storage Room or to the Pump Room.

### 3.53 Operating Costs

Recent, annual operating and maintenance costs at Campus Hills are as follows:

Personnel (FY 2014)	\$307,945
Operating* (FY 2014)	\$ 21,675
<u>Maintenance Costs (Calendar Year 2013)</u>	<u>\$ 5,720</u>
 Total	 \$335,340

\*Operating costs include utilities, equipment and expendable supplies.

### 3.54 Annual Maintenance Allowance Recommendation

Based on the age of Campus Hills and assuming each of the repair and renovation recommendations included in this report is addressed, the Design Team recommends that thereafter an annual maintenance allowance of \$25,000 be allocated.

### 3.55 General Assessment

Overall, the facility is in reasonably good condition given its age and is a valued aquatic resource for its patrons. The pool's most pressing deficiency is the poor condition of its dehumidification unit, which should assume a high priority for replacement in future capital improvement funding.



Top:  
Pump Room.

Bottom:  
Check-in desk.

#### CH.1/Code Violation - Non-ADA-Compliant Dry Ramp

The facility's dry ramp is no longer compliant with the accessibility code as a means of accessing the swimming pool.

Recommendation: Install an ADA-compliant lift on the deck near the shallow end of the pool. A battery-operated lift is recommended. (Note, this improvement was completed April 2015)

#### CH.2/Code Violation – VGB Drain Covers

The warranty for the two existing drain covers has expired as of March 2015.

Recommendation: Replace both VGB drain covers.

#### CH.3/Code Violation – Depth Markers

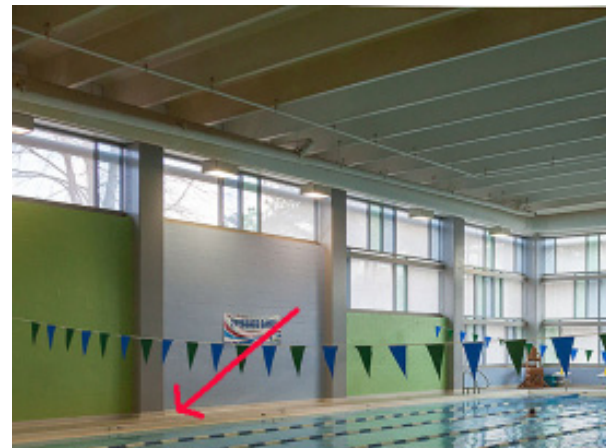
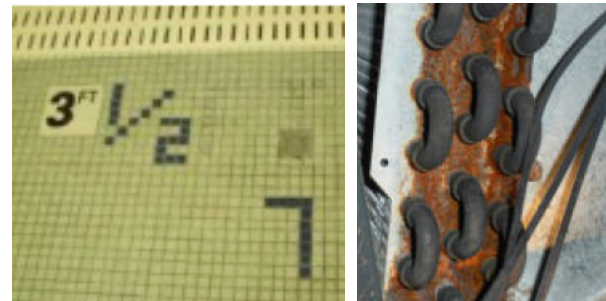
Several of the depth markings and “No Diving” markers are inaccurate, worn or hard to read and inconsistent with code requirements for legibility. The Health Department has cited this deficiency in previous reviews of the facility.

Recommendation: Contract with a swimming pool technician to perform a detailed assessment of the accuracy and code-compliance of all existing depth and “No Diving” markers. The installation of a tile band marking the transition from shallow to deep water is recommended to be placed marking the five-foot pool depth. The technician should prepare a cost estimate for satisfying the code's requirements including proper placement of the change in slope tile line, and perform replacement work as necessary. The use of inlaid ceramic tile markers is recommended.

#### CH.4/Code Violation – Rest Room Handrails

Vertical handrails in accessible toilet stalls are required by the current ADA.

Recommendation: Provide one vertical handrail in each designated accessible toilet stall.



Top:  
Dry ramp.

Middle Left:  
Inaccurate depth markers.

Middle Right;  
HVAC coil corrosion.

Bottom:  
Deck depth less than code minimum of five feet at pilaster.

#### CH.5/Code Violation – Non-Compliant Deck Width

The Health Code requires at least five feet of clear walking space at all points around an indoor pool. At Campus Hills, the distances between the pool's edges to the wall is five feet at the shallow end and 4'-10" to the face of the wall pilaster by the deep end. With egress grab rails the deck width measures from pool edge to grab rails is as little as three feet.

Recommendation: Short of enlarging the present size of the Natatorium, there is no economical means to satisfy this code requirement. It is grandfathered as an acceptable, non-compliant condition. From an operational perspective, the lifeguard staff should carefully monitor those areas of less than minimum clearance and make sure no movable obstructions further reduce the remaining clear deck space.

#### CH.6/Code Violation – Chemical Storage

The quantity of Calcium Hypochlorite observed stored at the facility must be reduced to less than 250 lbs. (IFC 105.6.20). Appropriate signage should be located on either the doors to the chemical storage room or the pool mechanical room.

#### CH.7/Age - Dehumidification System

The HVAC system at Campus Hills is in extremely poor condition. As a consequence, the Natatorium experiences poor air quality, inadequate air circulation and difficulty in maintaining appropriate temperature and humidity levels *The conditioning unit is undersized for the use and capacity of the pool and is highly inefficient, resulting in excessive energy consumption.* The pool area is currently conditioned and dehumidified with a Dectron interior pool dehumidifier unit (Dectron DSF120-7) with pool heating and building heat provided by the building HW boiler (Lochinvar CHN 2071). The Dectron unit is also provided with an air-cooled liquid cooler (Dectron KVG116-46). The pool units were installed in approximately 2004, while the boiler was replaced in 2011 as part of a major building renovation. The boiler provides heating for the pool water through the original

heat exchanger, with some supplemental heating provided by the Dectron unit. During the 2011 renovation, a HW coil was added to the pool unit supply air ductwork to provide additional winter season space heating. The original pool liquid cooler was damaged by vandals during the 2011 renovation and was replaced with the current unit.

The Dectron dehumidifier unit has only one refrigerant circuit. The current refrigerant is R-22, a product that is being phased out by 2020. The unit has experienced multiple refrigerant leaks and exhibited signs of substantial corrosion on all components within the unit that are exposed to the air stream. The corrosion indicates that the return air contains a significant portion of corrosive chloramines from the pool water. The return air louvers are located in the ceiling of the second floor mezzanine at approximately 8 feet above the pool deck. This location should improve the quality of the return air; however, the corrosion of the 10-year old unit indicates that significant chloramines are still being returned to the unit. The higher level returns also will not assist in ventilating the air quality directly at the surface of the pool, where chloramine concentrations will be highest.

Chloramine concentrations experienced at the pool have been cited by the Health Department but to date there is no concrete evidence that elevated levels of chloramines present a significant health risk. More typically, the concentration levels make the patron and staff experience uncomfortable with the most pronounced effects being the sense of eyes watering and burning, respiratory irritation and unpleasant odor.

A brief review of the airflows specified in the documentation for the HVAC unit replacement in 2004 indicates that the unit airflow of 11,000 cfm provides an air turnover rate of only 3.1 air changes per hour. This is not within the ASHRAE recommended rates of between 4 and 6 ACH. A review of the specified fresh air rate of 2700 cfm, calculation indicate that the rate is below current ASHRAE recommendation of 2870 cfm based upon the area of the pool and a 6' wide "wetted" deck perimeter. Recommendation: Based upon the poor condition of the existing pool dehumidification unit and the phase out of R 22 refrigerant,

it is recommended that the existing dehumidification unit be replaced. The replacement unit should specify that all coils and components in contact with the air stream should be provided with corrosion resistant coatings, and provide an airflow rate of 15,000 cfm to provide the minimum air turnover rate. The system should provide 100% outside air capability for peak occupancies and purge capability.

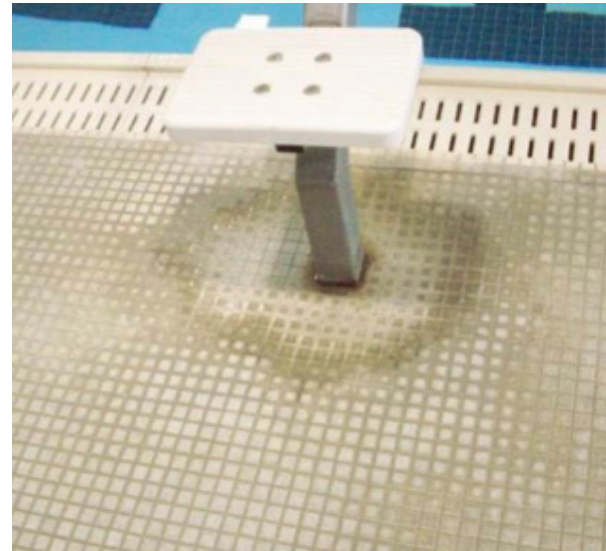
In addition, a dedicated, low-level exhaust system to exhaust at the level of the water surface/pool deck should be installed. The new exhaust system will remove the low-level chloramine contaminants and allow fresh conditioned air to circulate at the water surface, improving air quality for the pool occupants. By extracting the majority of the corrosive components from the return air stream, the low level exhaust should extend the life of the new dehumidification unit to its expected life span of 15 or more years. The exhaust system should include energy recovery system. This work will also likely require an upgrade to the present electrical service.

This system will offer far greater efficiency in the conditioning of the space with considerably lower utility costs. The new dehumidification unit will have an expected service life of between 15 to 20 years. At the time of system design, a life cycle cost analysis should be prepared to confirm the magnitude of anticipated energy savings in relation to initial installations costs.

#### CH.8/Age – Natatorium Lighting

The Natatorium is illuminated by ceiling-mounted, down-light fixtures with metal halide lamps. The fixtures have been recently re-lamped with new 400W lamps. Facilities Operations maintenance personnel have reported that the ballasts are failing prematurely and the ballasts spark when the fixtures are turned off, showering building occupants with hot embers. This is a serious safety hazard that can occur at any time without warning. By visual inspection, the fixtures do not appear to be properly rated and/or sealed to protect internal components from the atmospheric conditions inside the pool area. It is presumed that corrosion, moisture, or improper grounding is the probable cause of the sparking reported.

Recommendation: The existing fixtures should be replaced with new, energy efficient ceiling fixtures in the same approximate locations, with all circuit and grounding connections to be inspected for continuity. New fixtures should have sealed lenses and be suitable for the corrosive environment present or have ballasts housed in a remote location.



Top:  
Ponding at pool deck.

Bottom:  
Sand accumulation in pool shell  
suggesting filter damage.

#### **CH.9/Age – Broken Deck Tile and Deck Ponding**

The tile on the pool deck is uneven and does not completely drain in various locations around the deck drains and starting blocks, making these areas difficult to clean, keep dry and maintain. The grout, tile and deck have been cleaned with many different cleaning products, but none have proven effective in restoring or preserving the tile finish. The deck tile has been patched and replaced in several locations around the starting blocks and skimmers. The remaining original tile has areas that are missing grout or are chipped or stained. Many missing tiles have been replaced but tiles continue to break and chip, presenting a safety hazard for patrons and staff.

Recommendation: The deck tile and grout is in need of immediate repair and/or replacement, with complete tile and grout replacement being the only assured method of resolving the present drainage, cleaning and safety hazard issues. If a full tile replacement is either economically unfeasible or not desired, all existing tile should be removed and replaced with a top coating of non-slip concrete.

In lieu of complete deck flooring surface replacement, an allowance of approximately \$5,500 should be directed to those areas of the existing tile most in need of immediate repair. This alternative would not resolve the ponding of water on the deck, nor would it represent a satisfactory long-term solution to the problems of cleaning and safety currently experienced at the pool.

#### **CH.10/Age – Pool Shell Finish**

As with Edison Johnson, the finish of the Campus Hills pool shell has required repainting, though not with the same frequency. For future shell repainting, a recommendation for more durable painted finish is recommended.

Recommendation: For all future shell refinishing, Tnemec epoxy paint or its equivalent is recommended for a more effective and long-lasting pool shell paint finish. The existing shell surface

should be power washed and stripped of old paint prior to any new painting. Instructions for the proper preparation of the shell surface are detailed in SSPCSP13/NACE 6, ICRI-CSP 2-4 Surface Preparation of Concrete and Tnemec's Surface Preparation and Application Guide, a copy of which is included in the appendix of this report.

#### **CH.11/Age – Stantrol Chemical Controller**

The present chemical controller is in good condition, however it is a Stantrol product that is no longer supported by its parent company, BECS. Repairs to this unit and replacement parts will become increasingly difficult to acquire.

Recommendation: The chemical controller should be replaced once it becomes difficult to procure replacement parts for the existing unit. Because chemical controller replacement is an issue that affects several other of the Department's pools, staff should evaluate and then recommend a preferred manufacturer for all controller replacements, based on their assessment of performance, cost, reliability and technical support.

#### **CH.12/Maintenance – Possible Sand Filter Damage**

Sand, whose only source would be the filtration system, has been observed collecting throughout the pool's gutter troughs. The presence of sand in pool water typically indicates broken laterals in a filter.

Recommendation: The filters should still be under warranty. Request a warranty inspection of the filters for damage that permits the loss of sand into the pool water. Should the damage not be covered by warranty, a cost allocation for this work is included in the estimate of costs. At the time of this inspection and possible repair, the filter sand should be replaced.

**CH.13/Maintenance – Corrosion and Steel Deck Paint Deterioration.**

Minor corrosion is visible on the steel wind framing located at the new curtain wall system. Similar corrosion appears on an exterior curved steel lintel located at the rear ground floor exit. In addition, there are areas of the underside of the structural metal deck in which the paint finish is peeling. None of these conditions is serious, nor do they represent an immediate structural concern.

Recommendation: The corrosion at the wind frames and curved steel lintel should be removed and a spray galvanization product should be applied and painted, sometime within 2-3 years. The exposed areas of structural deck should be repainted at some point, though as a conditioned interior space, this work is largely for the sake of appearance and does not constitute a structural issue.

**CH.14/Age – Minor Pool Shell Leakage**

There is minor leaking of the pool shell.

Recommendation: Investigate the pool shell, main drains and associated piping to determine the source of leaking water when the pool is shut down for annual maintenance.

**CH.15/Age – Roofing Leakage**

Staff reports there is leakage in the roof over the Natatorium in the general vicinity of roof top ventilator units and near the perimeter on the east. There is no visible evidence of differential movement in the structure, therefore the primary source is likely flashing around roof penetrations or faulty drain leader piping. At least one drain leader pipe has previously been replaced but it is reported to be continuing to leak.

Recommendation: Engage a roofing contractor to inspect the roofing membrane and make repairs as necessary, particularly in areas of flashing around roof top penetrations. Replace the

damaged drain leader with suitable pipe material and appropriate pipe hangers.

**CH.16/Upgrade – Dry Ramp**

The existing dry ramp is no longer ADA-compliant and is not used. Its position restricts the width of the deck impedes patron access to the deck from the pool.

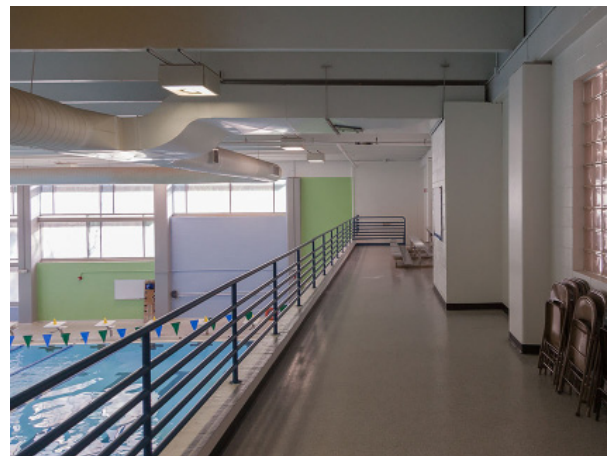
Recommendation: Infill the dry ramp and remove its handrail.  
(Note: This work was completed in April 2015)

**CH.17/Operational - Spectator Balcony Occupancy**

The maximum occupancy for the spectator balcony overlooking the pool is listed by the Fire Marshall's office as 50. This capacity is frequently exceeded during swimming competitions.

Recommendation: The occupancy for this space should be conspicuously posted. A minimum of two wall signs indicating the Fire Marshall's maximum capacity should be provided. Staff should be instructed to enforce this limit whenever it is exceeded by special events.

There is no practical way to increase the size of this space. Additional demountable bleachers could be installed and while this provision would not increase the space's rated capacity, it would improve site lines and user comfort. Prior to bleacher installation, the live loading capacity of the balcony must be determined to guarantee there is sufficient loading capacity for this addition.



Top Left:  
Lower level entrance

Bottom Left:  
Minor corrosion of steel lintel at  
lower level entrance

Top Left:  
Typical corrosion at wind frame.

Top Right;  
Natatorium mezzanine.

<h1>East End Park</h1>	 
<p>Address 1200 North Alston Avenue Durham, North Carolina 27701</p>	
<p>Summary Description Stand-alone sprayground</p>	
<p>Metrics Potable water flow discharging into sanitary sewer Water is not recirculated.</p> <p>Pool Season: 19 Weeks, May - September</p>	
<p>Year of Construction 1999</p>	
<p>Major Renovation(s) 2011 - Maintenance and accessibility upgrades</p>	

Facility: East End Park Sprayground									
Priority	Ref.	Issue	Category	Recommendation	Net Cost	Total Cost	Permit Req'd	A&E Design Req'd	Notes
2 Deferred Maintenance Aging Systems	2A.	Ponding Water Improper Drainage	Age	Curbing and Re-grading to Direct Drainage Away from Slab	\$ 4,000	\$ 5,520 (2)	Yes	Yes	EE.1
	3A.	No Dedicated Water Service	Upgrade	Provide Dedicated Water Service	\$ 20,000	\$ 30,360 (3)	Yes	Yes	EE.2
3 Building and System Upgrades									
TOTAL ESTIMATE OF PROBABLE COST						\$35,880			
<div>Keyed Notes</div> <div>(1). 20% Contingency</div> <div>(2). 20% Contingency + 15% P and O</div> <div>(3). 20% Contingency + 15% P and O +10% A and E Fee</div> <div>(4). 20% Contingency + 15% P and O + 40% A and E Fee</div>									
<div><div></div> Denotes Completed Work</div>									

### 3.6 East End Park Sprayground

#### 3.61 Overview

The East End Park is a stand-alone sprayground constructed in 1999. It has one overhead and one in ground spray feature. The sprayground operates on a flow-through potable water system so all water drains to waste. It has a painted concrete spray deck with one drain to waste.

The sprayground equipment is located external to the restroom building and has been vandalized several times in the past. The maintenance department has added locked enclosures around the equipment providing security for the sprayground equipment.

#### 3.62 Operating Costs and Recommended Annual Maintenance Allowance

At the time of this writing, no information regarding annual operating and maintenance costs has been made available. Based on the age of the sprayground and assuming each of the repair and renovation recommendations included in this report is addressed, the Design Team recommends that thereafter an annual maintenance allowance of \$500 be allocated.

#### 3.63 General Assessment

This sprayground offers limited but useful summer recreational opportunities of value to neighborhood residents. If well-maintained, it should continue to provide reliable service for the coming decade. If new sprayground projects serving the same demographic region are not constructed in the coming ten years, an upgrade or enlargement of this facility should be considered.

#### 3.64 Keyed Renovation and Repair Notes

##### EE.1/Age – Ponding Water

The sprayground drain is not at the lowest point of the painted concrete spray deck. A significant portion of the runoff is draining to the sidewalk and grass where standing water collects on the paved path to the tennis court entrance. Portions of the concrete curb on the side with the lowest elevation channels water to the side walk instead of the drain.

Recommendation: The sprayground concrete pad should be reconfigured to completely drain through the sprayground drain so the sidewalk is not flooded. A new curb and new concrete floor would redirect the sprayground water to the drain.

##### EE.2/Upgrade – Separation of Water Service

The sprayground and the restrooms are connected to a common water supply line and consequently when the sprayground is running, the lavatory water service becomes slow or non-functioning as there is not enough water pressure to operate the toilet flush valves.

Recommendation: Provide a new water supply piping to the sprayground. The estimate of cost assumes a 2" water line run from the adjoining street, a replacement water meter and the City's standard tap fee. A permit and engineered drawings will be required for this work.



Water ponding at sidewalk.

## 4.0 System Repair and Renovation Cost Summary

1. Does not include \$165,000 in additional repairs that may be required if current efforts to stop Pump Room water infiltration are not successful.

2. Assumes full replacement of all Natatorium light fixtures. For relocation of the fixtures only, the total cost would drop to \$766,522.

3. Includes full tile replacement for the pool deck. Providing only repair to the existing deck would reduce the total cost to \$917,802.

**At Right:**  
**Life Expectancy of Present City of  
Durham Pool Facilities After Completion  
of Recommended Repairs & Upgrades**



1. Replacement Dehumidification Unit (HVAC) life is estimated to be 15 - 18 years.

2. Does not include operating costs or routine annual maintenance costs and allowances after recommended repairs are made.

Forest Hills Pool	\$ 210,456
Long Meadow Pool	\$ 165,987 <sup>1</sup>
Hillside Pool	\$ 139,548
Edison Johnson Aquatic Center & Sprayground	\$ 887,992 <sup>2</sup>
Campus Hills Aquatic Center	\$ 934,362 <sup>3</sup>
East End Park Sprayground	\$ 35,880

Total \$ 2,374,225



## **5.0 Conclusions: Aquatic System Priorities**

### **5.1 Extend the Life of Long Meadow Pool and Forest Hills Pool but Plan for Replacement**

Two of the City of Durham's five swimming pools - Long Meadow Pool and Forest Hills Pool - are extremely old. Both far exceed the aquatics industry standard anticipated outdoor pool life span of 35 years. The pools offer only a narrow range of recreational swimming opportunities and have a relatively short, 9 1/2 week operating season. Long Meadow is located entirely within the flood plain and is subject to recurrent flooding. At Forest Hills, the Pump Room and Chemical Storage Room are within the flood plain and also frequently flood.

Long Meadow Pool also experiences significant leakage of its shell and has a serious problem with Pump Room water infiltration that risks accidental electrical discharge. This pool has been closed for the 2014 summer season while emergency repairs have been undertaken. These repairs have reduced infiltration to a sufficient extent to permit the re-opening of the pool for the 2015 season, but the Pump Room remains damp and should continue to be monitored for new infiltration sources in the coming years.

Both pools will continue to experience increasing costs for maintenance and are highly susceptible to largely unforeseeable failures of their structures and equipment. The flooding of either facility could easily result in damage whose value would likely exceed UDO and FEMA limits for flood plain renovation expenditures.

Based on the age, condition and flood plain location of each of these pools, both should be considered for eventual replacement. If the currently recommended repairs for Long Meadow Pool are completed and are successful, its service life could be extended another five years at best. If the currently recommended repairs for Forest Hills are completed, it could continue to serve as a limited-capacity neighborhood pool for an additional five to seven years.

### **5.2 Hillside Pool Shell Leakage and Repairs**

The water leakage from the pool shell at Hillside should be more thoroughly evaluated. In time, the accumulation of water in the soil surrounding the shell could undermine its structural integrity. There are a number of additional repairs and renovations that should be undertaken at the facility, including refinishing of the concrete deck and installation of a deck drain. In addition, the visibility and perceived poor security of the pool are issues that require attention. If all repairs and renovations recommended are undertaken, Hillside Pool should remain a productive aquatic resource for the next twenty-five years.

### **5.3 Replace the Dehumidification Units at Edison Johnson Aquatic Center and Campus Hills Aquatic Center**

The dehumidification unit at Edison Johnson is near complete failure. Without the use of this unit, temperatures and levels of humidity within the Natatorium would be impossible to control, leading to the closure of the pool. This unit should be replaced immediately. The dehumidification unit at Campus Hills is also in very poor condition and should be replaced within the next two years. In both instances, concurrent with unit replacement, a low-level exhaust system should be installed to reduce corrosion and improve patron comfort.

Prior to unit replacement, a cost-benefit study should be commissioned to determine the most effective energy efficient means of providing conditioned air for both facilities.

The lighting system at both pools should be replaced, although fixture relocation at Edison Johnson may be a reasonable, lower-cost option. If the remaining recommendations for repairs and renovations at these two facilities are completed, both should continue to serve the Durham community for another two decades or more.

#### 5.4 Systemic Aquatic System Issues

**Depth Markers:** Every facility in the Durham aquatics system has depth markers that are either inaccurate or are not compliant with the code. The markers should be brought into compliance with the code as soon as possible.

**ADA Access:** Four swimming pools: Hillside, Campus Hills, Long Meadow and Forest Hills, do not have accessible ramps. Each pool should have an ADA lift installed. The fifth pool, Edison Johnson, has a ramp that could be brought into compliance with a relatively minor repair, but a lift could be provided there as well.

**Security:** Although Hillside Pool and Long Meadow Pool are most frequently cited as facilities with concerns regarding their security provisions, this is an issue that should be more thoroughly addressed at all of Durham's aquatic facilities. A first recommended step is for the Parks and Recreation Department to analyze the security risks at each of its facilities and prepare a comprehensive policy regarding facility security. As has been noted, the Parks and Recreation Department is already developing similar policies for some of its other facilities, which could serve as a model for aquatics facilities. The final security plan should include an implementation schedule and estimates of both first time and operational costs.

**Deferred Maintenance:** Many of the deficiencies within the aquatics system are the consequence of inadequate funding of annual maintenance. The study recommends the annual allocation of funds for each pool to ensure that maintenance can be provided throughout the remainder of each pool's effective service life.

#### 5.5 Long-Term Planning

Even if every recommendation of this study is accepted, fully funded and implemented, Durham's swimming pools will still remain less than completely responsive to the aquatic recreation needs of the Durham community. Although the completion

of the repairs and renovations recommended by this report will result in facilities that are in compliance with applicable codes and in far better physical condition, they will still lack the kind of capabilities characteristic of a truly contemporary aquatics system that fully addresses the needs of its users and facilitates a full spectrum of aquatics programming.

The following are capabilities that a responsive municipal aquatic system should be capable of addressing:

**Competition Swimming** – Facilities with water temperature, water depths and pool shell configuration appropriate for swimming competitions, including adequate space for spectators, separate locker areas for team dressing and a warm-up pool for competitors.

**Aquatics Fitness and Exercise** – Facilities with dedicated space of appropriate water depth and temperature for patron lap swimming, aerobics and swimming education.

**Recreational Swimming** – Facilities with ample recreational amenities appropriately designed for patrons of varying ages and abilities.

**Therapeutic Aquatics** – Fully accessible facilities of appropriate water temperature and depth for the programming of group and individual aquatic therapy.

**Low-Cost, Non-Staffed Water Amenities** – Conveniently located sprayground parks that provide admission-free, aquatic recreational opportunities for non-swimming, disabled and very young patrons, all at a very low capital and operational cost to the City.

**Age and Ability Appropriate Aquatic Opportunities:** All of the pools in the Durham system need to provide opportunities for the benefit and enjoyment of patrons with special needs be they very young, disabled or non-swimming.

## 5.0 Conclusion

Providing these capabilities will require a comprehensive reconsideration of the current system and likely, proposals for new facilities that are designed to better address the variety of aquatic user needs within the City.

Equally important, consideration should be given the changes that have occurred in the demographics of the City of Durham over the past several decades. It is evident that the current locations of Durham's five pools and four spraygrounds are not well positioned to serve the needs of rapidly growing populations in the City's outlying suburbs.

It is recommended that the City commission a comprehensive master plan study with the goal of developing a clearly articulated, long-term vision for the future of the City of Durham's aquatics system over the next three decades.

## 6.0 Appendix

The Appendix to this report is contained in a CD that accompanies the hard copy version of the report. A digital copy of the Appendix may be requested by contacting the City of Durham Department of General Services.



Right  
Present location of City of Durham  
swimming pool facilities.

